

SCIENCE

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BEFORE AND AFTER LISTER

LECTURE II., AFTER LISTER

YESTERDAY the dominant note was one of despair and defeat. To-day the dominant note shall be one of joy and victory.

Instead of hospitals reeking with pus and emptied by death, of operation after operation, when the roll was called, reporting a mortality of 40 per cent., 50, 75, 90, and even 100 per cent.—we have hospitals of immaculate whiteness and emptied by quick recovery, while the roll-call of operations reveals very few mortalities exceeding 10 per cent.; most of them having fallen to 5 per cent., 2 per cent., 1 per cent., and even small fractions of 1 per cent.

The story of Lister's work as recorded in his successive papers¹ is one of the most fascinating in all surgery. His earliest studies, from 1853 to 1863, were in physiology and pathology. Next he took up his researches on putrefaction (or as we should now say infection and suppuration) which led to his devising the antiseptic system. He was influenced to make these observations and experiments, which he applied with such signal success to surgical problems, by Pasteur's earlier researches. He always cheerfully acknowledged his debt to the eminent Frenchman. When a student in Paris in 1865 I knew Pouchet fils and was an interested spectator in the fight between Pasteur and Pouchet's father as to spontaneous generation. Lemaire's book on "Acide Phénique" (carbolic acid) was published in that same year.

Bacteriology did not exist as a science, but Pasteur, Lister and a few of the elect

¹ Lister's Collected Papers, 2 vols., Oxford, 1909.

in the upper realms of imagination saw the "germs" or "microbes" and firmly believed them to be the cause of infection. In 1900, at the age of seventy-three, Lister restated his earlier work² and illuminated it by many observations, experiments and drawings made in these early years, but first published fifty years after they were made.

If you wish to know the man, his fertility in devising new and convincing experiments, and his mental acumen in interpreting them "read, mark, learn and inwardly digest" that paper and use it as a model.

Paré in his naïve way tells us that he sought various applications which might "mitigate the pains [of his patients] and happily"—mark the word "*happily*"—"bring them to suppuration." That is the "laudable pus" of the pre-Listerian days. Lister, on the contrary, believing that infection and suppuration were evils, and avoidable evils, sought by various means to prevent them. But he says "all my efforts [during his work in Glasgow, 1860-69] proved abortive," and then adds significantly "as I could hardly wonder when I believed with chemists generally that putrefaction was caused by the oxygen of the air."

They and he were deeply impressed with the absence of putrefaction in simple fractures when the air and its oxygen had no access to the fracture. In my own lectures, as I often used to express it, "The very best antiseptic dressing is an unbroken skin." In compound fractures on the other hand when the air and its oxygen *had* access to the lesion, putrefaction always took place and caused a frightful mortality.

To test this supposed noxious influence of oxygen he devised many experiments, and among them one which may be well called

an "experimentum crucis." He filled four flasks one third full of urine (a quickly putrescible liquid) and drew out the necks to tubes one twelfth of an inch in diameter. All these tubes were *left open*. Three of these long necks he bent at various angles downwards; the fourth was left vertical upwards and also open. He then boiled all four flasks and awaited the result. The air and its oxygen had free access to the urine, being slowly drawn in during the colder night hours and driven out in the warmer daytime. Any supposed "germs" floating in the air, he reasoned, being heavier than air, could not climb up the slanting necks and fall into the liquid. In a short time the urine in the flask with the vertical open neck was decomposed, but the other three flasks, also with open necks but bent downward, *remained undecomposed for four years!*³

Could there be a more convincing proof that the oxygen had no influence whatever in producing putrefaction, but that it was due to living matter, "germs," in the air? It was a fine instance of the "scientific use of the imagination." "Germs" had been observed from time to time, but had not been generally accepted as the *vera causa* of putrefaction. The experiment just related was tried about 1867. The commonest, all-pervading germs, the staphylococcus and streptococcus, were not identified and proved to be the chief pyogenic (pus-producing) organisms until 1881, fourteen years after Lister had seen them so clearly with his mind's eye! Even in 1898 when I published my "Surgical Complications and Sequels of Typhoid Fever" I had to prove by elaborate citations of experimental and clinical evidence that the typhoid bacillus itself could cause suppuration, and that it

³ For a fuller account of this interesting experiment with references see my "Animal Experimentation and Medical Progress," pp. 204-205.

² *Brit. Med. Jour.*, 1900, II., 969.

had actually been observed in the circulating blood—for the past ten years or more a work of supererogation.

From Glasgow Lister went to Edinburgh (1869) as the successor of his father-in-law, Syme, and continued to experiment, to practise and to publish, but only a few were convinced, among them being Syme himself.

On the continent in the early 70's Saxtorph in Copenhagen, Thiersch in Leipzig, Volkmann in Halle, Nussbaum in Munich, and Championnière in Paris were among Lister's earliest and enthusiastic disciples. In America not much attention was paid to his work until he visited Philadelphia in September, 1876, to attend the International Medical Congress held in connection with the Centennial Exhibition. He was made president of the Section on Surgery and read a paper on the antiseptic method.

At that time I heard him and became fully convinced of the truth of the "germ theory" and of the value of his antiseptic method. When I went on duty at St. Mary's Hospital, October 1, 1876, I adopted the system (and was the first surgeon in Philadelphia to do so) and have never abandoned it. For me it changed surgery from Purgatory to Paradise.

But the reception given to his paper at our congress was anything but enthusiastic. The only surgeon who practically accepted Lister's method was that excellent St. Louis surgeon, John T. Hodgen. But so hazy were the general ideas of bacteria that in his own paper Hodgen speaks only of "germs" and "germinal matter" and had no idea of bacteriology as we now know it, for the science, and even its name, did not yet exist.

In the discussion of Hodgen's paper Hewson advocated his then well-known views on the value of dry earth as an "antiseptic." Canniff of Toronto rejected in

toto the germ theory of putrefaction. Frank Hamilton, of New York, while claiming extraordinarily good results from the open-air treatment and the warm-water treatment and other rival methods, "damned with faint praise" the antiseptic method. Kinloch, of Charleston, took the same attitude; Carpenter, of Pottsville, a Civil War surgeon, advocated chlorine in septic cases. Others sang pæans in praise of "perfect cleanliness" and said they "used both carbolic and salicylic acids, but *not* for the purpose of excluding germs." In the discussion on Lister's paper, Van Buren, of New York, doubted the safety of the spray in hernia and abdominal sections and Satterthwaite, of New York, rejected the germ theory of putrefaction.

In 1877 Girard, of the U. S. Army,⁴ became the enthusiastic supporter of Listerism.

In 1880 Markoe, of New York, while admitting the fine results of Listerism, spoke of "its somewhat arrogant pretension to be the true and only gospel of the surgery of wounds."⁵

In 1882 Listerism was again discussed in the American Surgical Association. Briggs, of Nashville, endorsed Lister's method as "an epoch in surgery." Yet so limited was our knowledge of "germs" even then that warfare was waged only upon those "in the air." When these could be excluded he said "putrefaction . . . fails to occur." Yet Briggs qualifies his endorsement by saying that the

supremacy [of the antiseptic method as contrasted with other methods of treatment] . . . can not be demonstrated by statistics . . . and the present unsettled opinion concerning the proper status of his [Lister's] method is due in great measure to that fact.

⁴ Circular No. 3, Surgeon General's Office, August 20, 1877.

⁵ *Amer. Jour. Med. Sci.*, LXXIX., 1880, p. 305.

He emphatically dissented from the germ theory, and added

Carbolic acid is the keystone of the Listerian wound treatment. . . . The germ theory is at fault and furnishes a very unstable foundation for a system of wound treatment.

Moore, of Rochester, N. Y., proposed to exclude the air

by passing carbonic acid gas directly into the place where the operation is to be performed. In consequence of its being heavier than the atmosphere it preoccupies the space (!).

Campbell, of Georgia, "did not believe that bacteria . . . are the cause of that condition [suppuration]." The various men named were among our foremost American surgeons.

Lister's opponents entirely missed the great fundamental facts underlying the germ theory and Lister's antiseptic method, viz., that infection in all its various forms was always of bacterial origin—a wholly novel and momentous idea. Each form of infection, *e. g.*, tetanus, tuberculosis, typhoid, etc., it was soon proved, arose invariably and solely from its own specific kind of germ. Whether carbolic acid or any other germicide was the best was a mere matter of detail and not of principle.

In commenting on this discussion in which one prominent speaker is said to have asserted that Listerism "is now dead"—a remark I do not find in the *Transactions*—*The Lancet*,⁶ a belated, but then, and ever since, a real convert, truly said

Surely it is too late in the day to contest the truth of the germ theory.

Yet even a year later (1883) at the American Surgical Association while B. A. Watson, of Jersey City, fully accepted Listerism, other prominent surgeons of Philadelphia, New York, New Orleans, Mobile, and other cities even declared in the discussion that no surgeon in their

⁶ July 1, 1882, p. 1088.

cities or states used the method. McGraw, of Detroit; Dawson, of Cincinnati; Campbell, of Georgia; Prince, of Illinois, were "doubting Thomases," while Kinloch, of Charleston, and Nancrede, then of Philadelphia, advocated it.

But if its progress was obstructed in the United States, its foes in Great Britain were even more strenuous and for a season more successful.

In spite of the striking results in Glasgow and in Edinburgh Lister was looked at askance as "unorthodox."

In 1875 *The Lancet*⁷ had said there is less antiseptic surgery practised in the metropolitan hospitals than ever there was.

At the Clinical Society⁸ in a debate on antiseptic surgery in 1875, Mr. Maunder said with a fine, but, as the event showed, a too precipitate sarcasm:

Mr. Lister expects to prevent traumatic fever and . . . suppuration.

Timothy Holmes, while professing to have used antiseptics "for some years," declared his disbelief in Mr. Lister's theory with regard to "germs." *The Lancet's* editorial on the debate said it was "evident that few of the speakers either place faith in Lister's theory or carry out his practise in full."

After eight years in Edinburgh Lister was chosen professor of surgery in King's College, London, in 1877. This was the last stand of his opponents. The *British Medical Journal*, however, heartily urged the appointment of "the great surgeon of Edinburgh."

October 1, Lister gave his first lecture. He took as his subject "Bacteriology," though not using that title for, as Stewart said, "as yet the science had not a name."

⁷ October 16, 1875, p. 565.

⁸ *Lancet*, October 30, 1875, p. 628.

⁹ The earliest instance of the use of the word "bacteriology" I have found is a quotation dated 1884 in the Oxford Dictionary.

Stewart¹⁰ gives a vivid account of the dreary days during which he and the other assistants whom Lister had brought with him from Edinburgh wandered in the wards of other hospitals "heavy with the odor of suppuration" while Lister's own small wards were filled with empty beds. Instead of the Edinburgh crowds of "500 eager listeners" their "hearts were chilled by the listless air of the 12 or 20 students who lounged into lecture at King's"—only 12 or 20 students!

But a month later the tide turned.¹¹ A case of fractured patella was admitted and in violation of all surgical precedent, for in that septic era to open a knee-joint meant too often the loss of limb or even of life, Lister boldly opened the joint, but with every antiseptic precaution, and wired the two fragments together. This elicited the remark from a distinguished London surgeon:

When this poor fellow dies, some one ought to proceed against that man for mal-practise.

But the man *got well*. Soon after this a case with an enormous malignant tumor of the thigh, which had been declined by other surgeons, came to Lister. He amputated the limb and,

the members of the staff and students visiting this interesting patient were astonished to find him in a day or two sitting up in bed and reading a paper, being free from pain and free from fever.

A little later Paget and Hewitt both refused to operate on a lady of social importance with a large tumor of the shoulder-blade. Lister operated in the presence of Paget and Hewitt and she recovered without suppuration, fever or pain.

Yet two years later still (1879) Savory, Thomas Bryant, Tait and Spence, while claiming to practise antiseptic surgery so far as strict cleanliness was concerned, de-

clined to subscribe to Lister's doctrines or to practise his method.

But the enthusiastic acclaim of the International Medical Congress in Amsterdam in that same year set the seal of approval of the profession at large. This may be said to be the date of the general acceptance of Lister's theory and Lister's method. London then capitulated.

In 1902, twenty-three years later, London made ample amends for its persistent early skepticism by a most generous outburst. The Royal Society, of which Lister had been president and from which he had received two medals, gave a banquet in honor of the jubilee of his doctorate. It was a most distinguished occasion and was made preeminent by a happy sentiment by Mr. Bayard the American Ambassador. Said he, addressing Lister:

My Lord, it is not a Profession, it is not a Nation, it is Humanity itself which, with uncovered head, salutes you.

Better, far better, such a eulogium than the peerage which had been already bestowed upon him.

Having now traced so imperfectly the fortunes of the germ theory, let us see the results of Lister's labors. The first results are his own, especially in Glasgow. There the horrible conditions he has so startlingly portrayed¹² should have made his wards a charnal house.

The mortality in the other accident ward was so excessive that it had to be closed. But in Lister's ward, separated from the other only by a corridor twelve feet wide, for the nine months "in which his antiseptic system had been fairly in operation . . . not a single case of pyemia, erysipelas or hospital gangrene had occurred."

The reason for his first attempt to apply

¹² *Lancet*, 1870, I., pp. 4, 40, and quoted in my "Animal Experimentation and Medical Progress," pp. 216-18.

¹⁰ *Wrench*, p. 274 et seq.

¹¹ *Wrench*, p. 278 et seq.

the antiseptic system to man is well stated in his very first paper on the antiseptic method in 1867.¹³ He wrote

The frequency of disastrous consequences in compound fracture, contrasted with the complete immunity from danger to life or limb in simple fracture, is one of the most striking as well as melancholy facts in surgical practise.

Well might he say this, for while simple fractures had practically no mortality, the mortality of compound fractures was all the way from 28 to 68 per cent.! In this, his first paper, he reported in detail eleven cases, with one death, an unheard of mortality of only 9 per cent.!

Thus encouraged, he attacked with an equally happy outcome abscesses, especially that bane of surgery in those septic days, abscesses of the spine. Be it observed too that fifteen long years were to elapse before the tubercle bacillus, the cause of such abscesses, was discovered by Koch (1882).

From accidental wounds it was but a step to deliberately inflicted wounds, *i. e.*, surgical operations. Here too preventive antiseptics gave equally valuable results.

Lister, however, was much more given to establishing principles and methods than to statistics, but some of his early disciples published striking proofs of the value of his method by contrasting their former results with those which followed the acceptance of the germ theory and the adoption of Lister's antiseptic treatment.

Thus Dennis¹⁴ (1890) says that

The time is within my own recollection when, in Bellevue Hospital, amputation was immediately performed as a routine treatment to prevent blood poisoning, upon the admittance of a compound fracture; and this operation was considered by surgeons as offering to the patient the only chance of recovery.

This but corroborates what Syme had

¹³ *Lancet*, 1867, I., p. 326 *et seq.* and II., p. 95, and Lister's "Collected Papers," II., p. 1.

¹⁴ *Medical News*, April 19, 1890, p. 423.

already said in Edinburgh, that on the whole he was inclined to think

it would be better if in every case of compound fracture of the leg amputation were done without any attempt to save the limb.¹⁵

Dennis in his paper reported 681 cases of compound fracture, with only 19 deaths, a mortality of only 2.8 per cent., and only one of these 19 deaths was from sepsis, or 1/7 of 1 per cent.!

In Nussbaum's insanitary hospital in Munich, which Lister visited in the summer or autumn of 1875, he states¹⁶ that pyemia had been

very frequent and hospital gangrene which made its appearance in 1872, had become annually a more and more frightful scourge until in 1874 it had reached the astounding proportion of 80 per cent. of all wounds that occurred in the hospital, whether accidental or inflicted by the surgeon!

After trying every possible different method of treatment and still being unable to combat hospital gangrene and pyemia, Nussbaum finally adopted Lister's full antiseptic treatment and from the beginning of 1875 they had "not had one single case of hospital gangrene . . . and were doubtful whether they had had one case of pyemia"; and

the convalescent wards—which previously had been filled and overflowing constantly—Lister saw standing one after another empty, because patients, no longer affected with hospital gangrene, recovered much more rapidly.

In Halle Volkmann¹⁷ was operating in an extremely unhealthy hospital in small, overcrowded wards, with the toilet rooms opening directly into them and a large drain running directly underneath. It was so

¹⁵ Cameron, *Brit. Med. Jour.*, December 13, 1902, pp. 1844-45.

¹⁶ *Brit. Med. Jour.*, 1875, II., p. 769, and "Lister's Works," Vol. II., p. 248.

¹⁷ "Lister's Works," II., pp. 249-51, *Brit. Med. Jour.*, 1875, II., p. 769, and Lindpainter (Volkmann's assistant), *Deutsch Zeit. f. Chir.*, October, 1876, p. 187.

bad that it had been condemned to demolition. In the two years after his introduction of the antiseptic method in 1872, no single patient suffering from compound fracture had died either from the fracture or from a necessary amputation, nor was there a single death from secondary hemorrhage or gangrene. No case of blood poisoning had occurred for a year and a half, though sixty amputations had been done. Just before Lister's method had been introduced, of 17 amputations 11 had died from pyemia alone, a mortality of 65 per cent. Just after adopting Listerism the death rate of his amputations fell to 4 or 5 per cent.¹⁸

Hospital gangrene had been as it were "blown away" by a puff ("weggeblasen"); not a single case occurred. In Lindpainter's extensive tables of Nussbaum's cases one is struck, on glancing over them, to see how before the antiseptic method was adopted case after case is marked "died," "died," "died," and in the later tables, after its adoption, almost a uniform "recovered," "recovered," "recovered."

But the most striking testimony to the value of Lister's services to suffering humanity is not the statistics of the mortality in amputations, compound fractures, puerperal fever¹⁹ or in any single disease or operation, but in the enormous and successful enlargement of the beneficent field of surgery. In my own early days "before Lister" the common operations were

1. Amputations.
2. Ligation of arteries.
3. Removal of external tumors.
4. Lithotomy.
5. Tracheotomy, chiefly for croup and foreign bodies.

A few resections, colostomies, trephining

¹⁸ *Lancet*, 1881, II., p. 281.

¹⁹ See the extraordinarily interesting paper by J. Whitridge Williams, *Jour. Am. Med. Ass.*, April 22, 1911.

(when unavoidable) and herniotomies (for strangulation) were done. Ovariectomy was never done until the tumor had become so large as to threaten life, and even then operation was denounced by many as wholly unjustifiable, for it had a mortality as high as two out of every three cases. The head, the chest, the abdomen were ticketed "*Noli me tangere*" except in the rare cases when operation was absolutely unavoidable.

I used to wonder why the students in "Rab and His Friends" rushed to the amphitheater to get the best seats to see Syme amputate a breast—a so very common operation nowadays. But then I recalled the fact that even in my student days, when anesthesia was the rule, capital operations were rare. But in the preanesthetic days operations were far rarer. In the *five years* preceding the introduction of ether at the Massachusetts General Hospital the *entire staff* only performed in all *184 operations* or *three operations a month*. When operations had become not only painless, but safe, then the number performed increased almost at a geometrical ratio, so that at present the numbers even of single operations by single surgeons—*e. g.*, of ovariectomies, appendectomies, goiters—mount into the thousands. What is still more gratifying, the usual death rates of most capital operations in the pre-Listerian days of one patient in four, in three, or in two, or even two out of three (!) have been changed to one in twenty, thirty, fifty, or to even less than one life lost in one hundred or even one in two hundred operations!

It is impressive—most impressive—to call the list of only the most frequent and the most important of our present operations. Were Mott, Bigelow or Pancoast—all of whom I remember well—to come to life again they would wonder whether we were not stark crazy.

The following list I have made—*currente calamo*—on the instant.

Amputations are far *less* frequent. After a single battle in the Russian campaign, Larrey, Napoleon's great surgeon, performed not less than 200 amputations. To-day of 200 similar cases, sometimes even with wounds involving joints, the great majority would recover without amputation.

Formal ligations are far fewer.

External tumors of any size are now removed from all parts of the body without fear of erysipelas, which so worried Sir Astley Cooper before he operated on the king for a simple wen. The mere fact that any tumor is internal—inside the head, the chest, the abdomen, or the pelvis—has practically no influence on the decision whether it should or should not be removed.

Trephining—even for exploration—is frequent and *per se* involves slight danger, as in decompression.

Martin, of Berlin, has done over 1,000 ovariectomies, with a mortality of less than 2 per cent., and the Mayos from 1905 to 1914, inclusive (the only period for which I had the annual reports at hand), reported 609 cases with 5 deaths, or eight tenths of 1 per cent. Colostomy and enterostomy are frequent. Many thousands of hernias have been cured by operation, with practically no mortality; and if done early in strangulation, with slight mortality.

The new surgery of the head attacks tumors even of the hypophysis, punctures the lateral and the fourth ventricles with impunity, successfully extracts foreign bodies and in some cases relieves epilepsy and mental derangements.

In the neck simple goiters even of large size are removed, with a mortality of 1 and 2 per cent.; and laryngectomy is common.

In the chest, that very citadel of life, the heart itself is sutured for gunshot and stab wounds, saving one life out of two; the

esophagus is attacked for cancer and the removal of foreign bodies; large portions of the chest wall are removed for old empyemas, and the lungs can now be operated on at leisure, thanks to insufflation anesthesia.

In the abdomen, the various operations on the stomach, even to its total extirpation, are too many to name in detail; and with a success that is truly marvellous. We play with the intestines at will, opening them for foreign bodies and for drainage of the contents, removing what we wish, anastomosing them and short circuiting their contents. Tumors of the liver unless malignant are extirpated with a very low mortality and wounds of its substance are treated with success; gall stones and gall bladders are removed every day; the spleen is anchored, sutured or removed as we find best; the pancreas is no longer inaccessible; the kidney and the ureter, like the stomach, have their own list of operations far too long to rehearse.

In the pelvis the bladder is opened and partly or even wholly extirpated; the prostate removed; the uterus, the ovary, the tubes, the parovaria have a long list of life-saving, comfort-giving operations to their credit.

We suture and anastomose nerves; we suture and anastomose blood vessels even in the new-born, we criss-cross the circulating blood to prevent gangrene, and endo-aneurismorrhaphy has practically banished the Hunterian operation for aneurism and saved many a limb and life. We transplant skin and bones and joints, and even half joints, with success. To all these we have added the X-rays, the serum and vaccine treatment of many surgical disorders and are gradually throttling disease, sometimes at its very birth.

It almost takes one's breath away! Yet

it is an incomplete and ever-lengthening list! As Mumford²⁰ well says:

Daring has become conservatism; rashness has become common sense.

Practically our ability to do all these life-saving operations is the result of the researches, the experiments, and the achievements of Lister and his followers. Had antiseptics not made all operations, including the opening of the head, the chest, the abdomen, and the pelvis, safe, we should still be practising the very limited surgery of the 60's. Every year thousands whom now we restore to life and health would still be dying.

What now are the prospects of Listerism in the present horrible war? I have so far used the term "antiseptics." Asepsis is a later and a natural development of antiseptics and in civil life is of course preferable. The underlying and enduring principle of Listerism—the germ theory—is the same in both. There is no fundamental antagonism, but really a fundamental agreement between the two methods.

In the present war the surgeons whose papers I have so far read are almost a unit in favor of the antiseptic rather than the aseptic treatment of the wounded. They are right in my opinion, and the reason is plain. Comparatively few of the wounded reach hospitals with uninfected wounds. Mild wounds, and even in some cases severe ones, if they can be dressed soon after being inflicted, heal readily.

Sir Anthony Bowlby's²¹ striking description of the conditions in the trenches shows the difficulties very clearly:

In this trench warfare, if a man is hit, he often falls into filthy mud and water, which may be three feet deep or more. The trench is only two and a half feet wide. It is night, you can only grope about in the dark and can do no dressing of any kind, for you can't even get any clothes off in the dark, and in so cramped a space, and you

²⁰ Keen's "Surgery," I., p. 76.

²¹ Jour. Am. Med. Ass., April 10, 1915, p. 1257.

must try to get the man away to a "dressing station" half a mile distant, and thence to a field ambulance. If it is daylight, you can't get the man out of the trench at all, and he may have to be kept there for many hours, because he would certainly be killed if he were got out of the trench. And the water in the trenches is hopelessly polluted and soaks his clothes and his wound. Large lacerated wounds, and especially bad bone smashes, are so contaminated that it can never be possible to render them aseptic.

There is a noteworthy difference between the results of the wounds in the case of the trench-inhabiting soldiers and the wounds of sailors. The latter escape the dangers of the soil-infected trenches.

Sailors with the most severe type of wound, ragged, irregular, with uneven surface produced by herniated muscle and retracted severed fibers, usually have recovered promptly. Soldiers suffering from slight wounds have often had them contaminated with bacilli from the soil; particularly the anaerobes.

Hypertonic salt solutions like sea water are actually remedial by promoting the flow of lymph and serum in the wounded tissues.

But in a very large number of wounded soldiers, possibly the majority, hours and sometimes even days of delay ensure infection and then the surgeon is face to face with the one overwhelming surgical problem which has so far baffled all our efforts, viz., *how to transform a septic wound into an aseptic wound and keep it so, and at the same time how to combat the toxins already diffused throughout the body, but without doing harm to the patient himself.* Cheyne,²² Ehrlich, Wright and Carrel are all at work and it may be that the happy day when this, the most pressing and urgent problem in surgery, shall be solved, may come through this devastating war.²³

²² Lancet, February 27, 1915, p. 419.

²³ In the British Medical Journal of April 10, 1915, a most important article by Sir Almuth E. Wright on "Wound Infections" is begun. This should be very carefully read. On pp. 735-38 of

Meantime Souttar²⁴ extols plenty of fresh air or better still of oxygen (our old supposed enemies in the 60's) and says

Men with wounds so foul that their presence in the wards could not be permitted, were placed, suitably protected, in the open air, the wounds being left exposed to the winds of heaven, covered only with a thin piece of gauze. The results were almost magical, for in two or three days the wounds lost their odor and began to look clean, while the patient lost all signs of the poisoning which had been so marked before.

Of tetanus in our Civil War there were in the Union army in all 505 cases and 451 deaths, 89.3 per cent. In the War of 1870-1 in the German army there were 294 cases and 268 deaths, or 91.1 per cent. In the present war there have been many cases in the allied armies in the west, but I have seen no numbers or percentages. In the German army, however, Czerny²⁵ says that the greatest danger to the wounded had been tetanus. Of 60,000 wounded Bavarians, 420 developed tetanus, which proved fatal in 240 cases (57.1 per cent.). The prophylactic value of the tetanus serum had been established, but its extensive employment was not always feasible.

This is a far larger percentage of cases than in our Civil War, or the Franco-Prussian War, but the mortality is far less—probably due to the even partial employment of the serum.

During the Civil War I never saw a case of "gas gangrene" which has been so prevalent and dangerous in the present war. The soil of Belgium and France, which has been cultivated and roamed over by animals for more than twenty centuries, is highly infected. Over ten different gas-producing bacteria have been found.

the same *Journal* for April 24, 1915, is another very important paper giving full directions for treatment. See also an interesting editorial in the *Journal American Medical Association*, May 23, 1915, p. 1765.

²⁴ *Brit. Med. Jour.*, March 20, 1915, p. 504.

²⁵ *Brit. Med. Jour.*, March 20, 1915, p. 521.

Sidney Rowland's experiment²⁶ well shows the virulent infection of the soil. Shaking up some of the soil from the trenches with some water, he injected a few drops into a guinea-pig and it was dead in eighteen hours with widely diffused gas gangrene. Soldiers have died from the disease in thirty-six hours.

Delorme has advised, as the germ is anaërobic, the injection of peroxide of hydrogen. Hartmann believes it needful to open the wounds freely and employ thorough irrigation with the peroxide²⁷—a most important procedure. *Early* treatment of infected wounds even in cases of gas gangrene resulted favorably in the hands of Cazin. Of 158 cases received even up to forty-eight hours after battle all recovered in spite of their serious nature. Among those received after four or five days' transportation the mortality reached 10 and even 20 per cent.²⁸

I have related the terrible mortality from typhoid in the Boer and the Spanish-American wars. The one bright spot in the present war is the conquest of typhoid. In spite of greatly increased numbers and of most unfavorable sanitary conditions in the trenches as I have shown, conditions which in former wars would have given rise to dreadful epidemics of typhoid, the following statistics in the British army officially given to Parliament on March 4, 1915,²⁹ show emphatically how well this scourge of every past campaign has been conquered. There had been only 606 cases in all: 247 among the partially (136) and fully (111) inoculated, with two deaths (0.81 per cent.), and 359 among the unprotected, with 48 deaths (7.47 per cent.), over nine times as many deaths proportionately! The one

²⁶ *Brit. Med. Jour.*, November 28, 1914, p. 913.

²⁷ *Jour. Am. Med. Ass.*, January 16, 1915, p. 259. See also Lawson and Whitehouse, *Brit. Jour. Surg.*, January 9, 1915, p. 444.

²⁸ *Jour. Am. Med. Ass.*, January 16, 1915, p. 259.

²⁹ *Brit. Med. Jour.*, March 13, 1915, p. 485.

reason for this splendid showing is the use of the antityphoid inoculation. If instead of its being only voluntary in the British army it had been compulsory as in our own army, the results would have been even better. And yet a blatant band of men and women both in England and our own country are doing all they can to oppose the use of this life-preserving remedy!

Let us now in conclusion take a general review of the surgical progress I have so inadequately sketched.

During the horrible days of Paré, Bell, Simpson, and our own Civil War there was still gradual improvement, but no *fundamental* change occurred for three centuries after Paré introduced the ligature and banished the boiling oil.

But about the middle of the nineteenth century, and especially in its last quarter, experimental research took the field. Everything that could be put to the test of accurate experiment in medicine and surgery was thoroughly investigated physically, physiologically, chemically, microscopically, biologically, bacteriologically. Laboratories were founded and research workers vied with each other in countless investigations. A flood of light was thrown upon every problem. And see the result in the long list I have just read to you! Medicine proper, obstetrics, all the specialties, sanitation and hygiene, furnish equally impressive calendars of progress—principally the result of experimental research.

Chief among these experimental researches were those of Pasteur (of whom I have said far too little for want of time) and of Lister. They inaugurated a wholly *new era* in surgery.

Then followed the battle for the germ theory and antiseptic surgery, ending in final victory. Meantime a new science, bacteriology, was born.

Next came the wide extension and appli-

cation of the new surgery to almost all the surgical ills that flesh is heir to. The wonderful results to both life and limb that I have recounted have naturally followed.

Even amid the disabilities and obstacles of war itself Lister's work has been a boon beyond price.

While the soldier and the scientist have been busy devising ever more frightful engines of destruction to maim and to kill, we surgeons have been equally busy devising means for saving thousands of lives and limbs in civil life, and even amid the carnage and savagery of war.

Surely our hearts should be lifted in gratitude to God for giving us such splendid powers of reasoning, experiment and research—all for the service of our fellow men.

W. W. KEEN

THE TWENTIETH ANNIVERSARY OF THE NEW YORK BOTANICAL GARDEN

THE twentieth anniversary of the appropriation by the City of New York of 250 acres of land in Bronx Park for the use of the New York Botanical Garden will be commemorated at the garden during the week commencing September 6, 1915. Botanists from all parts of North America are invited to attend. The following program is planned:

Monday, September 6

Assemble at the Garden as convenient in the morning.

1:30: Lunch at the Garden.

2:30: Addresses of welcome and an account of the history of the Garden.

3:30-5:30: Inspection of a portion of the grounds and buildings.

5:30-7: Visit to the Zoological Park.

Tuesday, September 7

10:30-1: Session for the reading of papers.

1:30: Lunch at the Garden.

2:30-4: Session for the reading of papers.

4-6: Inspection of portions of the buildings and grounds.

Wednesday, September 8

Salt Water Day on Staten Island, for a study of the coastal flora.

Lunch at 1:30, with subsequent opportunity for scientific oratory.

Thursday, September 9

10:30-1: Session for the reading of papers.

1:30: Lunch at the Garden.

2:30-4: Session for the reading of papers.

4-6: Inspection of portions of the grounds and buildings.

Friday, September 10

Visit to the pine barrens of New Jersey, under the guidance of the Torrey Botanical Club.

Saturday, September 11

Visit to the Brooklyn Botanic Garden and an excursion to some Long Island locality.

Other excursions of more special character will be organized if opportunity offers.

THE CORNELL MEDICAL SOCIETY OF NEW YORK CITY

ON February 4, 1915, twenty members of the teaching staff of Cornell University Medical College in New York City met at the college building and organized the Cornell Medical Society. The objects of this society, as stated in its constitution, are

to foster a better acquaintanceship among its members, to create an atmosphere of helpful and sympathetic criticism of the original work done in all departments of the Cornell University Medical College, and to promote the best interests of the college as an educational and research institution.

Four meetings, consisting of a scientific program followed by a smoker, are to be held each year in the months of October, December, February and April.

For the purpose of keeping in closer touch with the alumni of the college an annual day is to be observed in May, at which time

the regular college duties being suspended by vote of the faculty, the society shall conduct scientific demonstrations in the various laboratories of the college and in the hospital wards.

In the evening of this day the society, alumni and friends of the college shall give a dinner at

which the graduating class shall be the guests of the society.

The first regular meeting of the society this year was held in March and was attended by fifty members of the teaching staff; the second, held in April, was attended by sixty men, most of whom had become members.

The first annual day was held Friday, May 21. The regular classes, except those for the fourth year, were held, but a special program was prepared for the visiting alumni. About sixty alumni visited the college, some of them coming from a distance.

The first annual dinner was attended by 126. The president of the society, Dr. John A. Hartwell, presided and toasts were responded to by Drs. W. Gilman Thompson, Graham Lusk, Frank S. Meara, for the faculty; by Dr. Arthur M. Wright, class of 1905, for the alumni, and Mr. Douglas Palmer, for the graduating class.

The organization of such a society has fully justified the belief of its originators that it would serve a useful purpose. The meetings already held have demonstrated the advantages of bringing the members of the various departments into closer contact with the work being done in departments other than their own and of arousing in the alumni an interest in the progress which has been made since their graduation.

HOTEL RESERVATIONS FOR THE SAN FRANCISCO MEETING OF THE AMERICAN ASSOCIATION

THE Pacific Coast Committee of the American Association respectfully suggests that those who plan to attend the San Francisco meeting of the association during the week beginning August 2 should consider making their hotel reservations at once. A deposit amounting to ten per cent. of the anticipated total cost of the service should accompany the request for the reservation. This sum will be credited upon the hotel account.

The hotels on the appended list are comfortable and conveniently located. There are many other excellent hotels in San Francisco and vicinity, and printed information concerning them may be secured by addressing Mr.

Kirk Harris, Manager, Official Exposition Hotel Bureau, Flannery Bldg., Corner Kearny and Market Streets, San Francisco.

In selecting a location, it should be borne in mind that the opening session of the convocation week, for the presentation of the addresses of welcome and the response thereto, for announcements and for the president's address, will be held in San Francisco at 10:00 o'clock, Monday morning, August 2, in the Scottish Rite Auditorium, corner of Sutter Street and Van Ness Avenue; and that the social reception to visiting scientists and their friends on Monday evening and the general sessions of the association, including four lectures on Pacific-region subjects on Tuesday, Thursday, Friday and Saturday evenings, will be held in San Francisco. On Wednesday, August 4, the association will hold its sessions at Stanford University, near Palo Alto, thirty miles southeast of San Francisco. It is expected that a special train will leave San Francisco at a convenient hour on Wednesday morning for Palo Alto and return to San Francisco late in the afternoon. All other sessions of the week for the sections and participating societies will be held at the University of California, in Berkeley, where the main headquarters of the association for the week will be located. An information and service bureau will also be maintained in San Francisco.

Berkeley and Oakland are connected by several lines of electric railway (thirty minutes in transit; fare five cents). These cities are connected with San Francisco by rapid electric-car and ferry service operating every twenty minutes throughout day and evening (thirty-five to forty minutes in transit; fare ten cents), and with the exposition grounds by electric railway and direct ferry service at frequent intervals (fifty-five minutes in transit; fare fifteen cents).

SAN FRANCISCO HOTELS

(E, European plan; A, American plan)

Argonaut, 44 Fourth St. (E), 380 rooms, from \$1.

Cadillac, 380 Eddy St. (E-A), 115 rooms from \$1; American plan from \$2.50.

Carlton, 545 Turk St. (E-A), 150 rooms, from \$1; American plan from \$2.50.

Clift, Geary and Taylor (E-A), 300 rooms, from \$2.50; American plan, from \$5.

Dale, 34 Turk St. (E), 180 rooms, from \$1.50.

Exposition Inn, 2610 California (E), 110 rooms, from \$1.

Fairmont, California and Mason (E), 500 rooms, from \$4.

Golden West, 112 Powell (E), 190 rooms, from \$1.50.

Goodfriend, 245 Powell St. (E), 100 rooms, from \$1.50.

Granada, 1000 Sutter St. (E-A), 300 rooms, from \$2; American plan, from \$4.

Inside Inn, Exposition Grounds (E-A), 650 rooms, from \$1.50.

Normandie, 1499 Sutter (E-A), 200 rooms, from \$1.50; American plan, from \$3.50.

Palace, Market and New Montgomery (E), 500 rooms, from \$2.

Plaza, Post and Stockton (E-A), 282 rooms, from \$1.50; American plan, from \$3.50.

Stewart, 353 Geary St. (E-A), 250 rooms, from \$2; American plan, from \$4.

St. Francis, Geary and Powell (E), 1,000 rooms, from \$2.

Sutter, Kearney and Sutter (E-A), from \$1.50 American plan, from \$3.50.

Terminal, 60 Market St. (E), 165 rooms, from \$1.

Turpin, 17 Powell St. (E), 195 rooms, from \$1.50.

Von Dorn, 242 Turk St. (E), 150 rooms, from \$1.50.

Windemere, 776 Bush St. (E), 100 rooms, from \$1.50.

OAKLAND HOTELS

Key Route Inn, 22d and Broadway (E-A), 115 rooms, from \$1.50; American plan, from \$3.50.

Oakland, 13th and Harrison (E), 250 rooms, from \$2.

BERKELEY HOTELS

Baneroft, 2248 Telegraph (E-A), 56 rooms, from 50 cents.

Carlton, 2318 Telegraph (E-A), 108 rooms, from \$1; American plan, from \$3.

Claremont, Federal Realty Building (E), 175 rooms, from \$1.

Shattuck, Shattuck and Allston (A), 211 rooms, from \$1.50.

THE SCRIPPS INSTITUTE FOR BIOLOGICAL RESEARCH

THE Scripps Institution at La Jolla, near San Diego, California, is to have its facilities

greatly improved. Miss Ellen B. Scripps has announced to the regents of the University of California her intention to give to the university during the next two years \$100,000 for further equipment.

A concrete pier a thousand feet in length will be built, at which can lie the *Alexander Agassiz*, the sea-going vessel owned by the institution and used exclusively for its work. Additional aquarium facilities will be provided, all planned to be useful for scientific purposes, but in part to be available for public educational objects. A salt-water pumping plant and settling basin are also to be provided, and living quarters for a group of scientific assistants, graduate students, etc.

The Scripps Institution has a site of 177 acres, with a half mile of ocean frontage, well-equipped laboratories, residences for the scientific staff, a good working library, and excellent equipment. The land was given by the city of San Diego, while for the most part the other equipment has come by the gift of Miss Scripps, who has created also an endowment of \$150,000 for its work. The state of California gives to the University of California \$7,500 per annum as a contribution toward the work of the institution, and Director William E. Ritter and his staff give their whole time to the research work. It is much resorted to also by visiting investigators and special facilities are arranged every summer for competent graduate students.

SCIENTIFIC NOTES AND NEWS

THE Albert medal of the Royal Society of Arts for the current year has been awarded to Sir J. J. Thomson, for his researches in physics and chemistry, and their application to the advancement of arts, manufactures and commerce.

THE gold medal of the first class of the Panama-Pacific Exposition has been awarded to Mr. Thomas A. Edison, for his storage battery.

DR. SIMON FLEXNER, director of medical research of the Rockefeller Institute, has been given the honorary degree of LL.D. by the University of Maryland.

THE University of Maine has conferred its doctorate of laws on Professor E. F. Ladd, professor of chemistry in the North Dakota College and food commissioner of the state.

A COMPLIMENTARY dinner was given at the Harvard Club of Boston on the evening of June 2 to Dr. Theobald Smith, who has resigned the George Fabyan professorship of comparative pathology in Harvard University to take charge of the department of animal pathology in the Rockefeller Institute. About 200 men, many of whom are prominent in the scientific world, were present, and President Lowell, who presided, said he had received a great number of letters and telegrams from all parts of the world. The speakers at the dinner were: Dr. Frederick C. Shattuck; Dr. William S. Thayer, of the Johns Hopkins University; Dr. Simon Flexner, of the Rockefeller Institute; President Emeritus Charles W. Eliot; Dr. William H. Welch, of the Johns Hopkins University; Dr. E. H. Bradford, dean of the Harvard Medical School, and Dr. Smith.

As the coming commencement at Amherst College marks the fiftieth anniversary of Professor B. K. Emerson's graduation from the college and the forty-fifth year of his work as a teacher, the forthcoming number of the *Amherst Graduates' Quarterly* will contain an editorial in appreciation of his work in geology. The article will be illustrated with a portrait of Professor Emerson, and with views of the old and new geological lecture rooms in which most of his college instruction has been conducted.

A TESTIMONIAL dinner was given, on June 3, in honor of Dr. Francis Clifford Phillips and Mrs. Phillips at the German Club, Pittsburgh, Pa., by one hundred former students and friends who desired to show their love and esteem upon the occasion of Dr. Phillips's retirement from active service as professor of chemistry in the University of Pittsburgh. Dr. Phillips, who is well known professionally because of his contributions to the chemistry of gases and his active participation in the interests of the American Chemical Society, has occupied the chair of chemistry at Pittsburgh

since 1875 and is retiring under the terms of the Carnegie Foundation. Among the speakers at the dinner were Drs. Walther Riddle, Albert E. Frost, R. B. Carnahan and J. H. James, and Professor Alexander Silverman. As an expression of their high regard for his devotion to the University of Pittsburgh, the old students of Dr. Phillips presented him with a check for \$1,000.

DR. A. F. BLAKESLEE, professor of botany and genetics at the Connecticut Agricultural College, Storrs, Conn., has accepted the position of plant geneticist on the staff of the Carnegie Station for Experimental Evolution of the Carnegie Institution. His address after October 1 will be Cold Spring Harbor, Long Island.

DR. ALLAN J. McLAUGHLIN, commissioner of health, has established in Boston a new department to be known as the division of hygiene and has appointed Professor Selskar M. Gunn of the Massachusetts Institute of Technology and Simmons College as its chief. Some of the duties of the division will consist in directing child welfare work, public health nursing, promoting traveling exhibits, public lectures and distributing health bulletins and pamphlets.

DR. MATTHIAS NICOLL, JR., has been appointed assistant director of laboratories of the Department of Health, New York City.

DR. SAMUEL H. HURWITZ (M.D., Johns Hopkins, '12), formerly of the Harvard Medical School, has been appointed instructor in research medicine in the George Williams Hooper Foundation for medical research of the University of California.

HERBERT R. COX is leaving the U. S. Department of Agriculture to become an associate editor of *The Country Gentleman*, with headquarters in Philadelphia.

THE Cancer Research Institute connected with the Charité Hospital at Berlin has been placed in charge of Professor F. Blumenthal, formerly Leyden's assistant, during Professor Klemperer's absence at the front.

MR. J. E. CULLUM has retired from his position as superintendent of the Valencia

Meteorological Observatory, Cahirciveen, and the Meteorological Office has appointed Mr. L. H. G. Dines as his successor.

HERBERT M. WILSON, engineer in charge of the Pittsburgh Experiment Station of the United States Bureau of Mines, has resigned from the government service to become the director of a newly-formed organization to be known as the Coal Mine Insurance Association. Mr. Wilson was closely associated with Director Joseph A. Holmes in the inception and development of the Bureau of Mines. Early in 1907, when Secretary James R. Garfield added a technologic branch to the United States Geological Survey, Director Charles D. Walcott, of the survey, selected Joseph A. Holmes as chief of the new division and Mr. Wilson was appointed as his principal assistant. With the creation of the Bureau of Mines, Mr. Wilson became engineer in charge of the Pittsburgh station, a position which he has held ever since. The Coal Mine Insurance Association is a combination of ten American and British insurance companies that have associated themselves for the joint underwriting of coal-mine accident insurance.

UNIVERSITY AND EDUCATIONAL NEWS

Two anonymous gifts of \$150,000 and \$100,000 have been made to the Massachusetts Institute of Technology for dormitories. Funds with which to construct the mining building, some \$225,000, have been offered to the institute by Charles Hayden, '90, of Boston, and T. Coleman du Pont, '83, and S. Pierre du Pont, '90, of Wilmington, Del., past and present presidents of the du Pont de Nemours Powder Co. Coleman du Pont, it will be remembered, with his gift of \$500,000, made the purchase of the Technology site in Cambridge possible. Charles A. Stone, '88, and Edwin S. Webster, '88, of Boston, will provide a residence for the president.

MR. JOHN R. LINDGREN, of Chicago, has bequeathed half his estate, valued at \$1,050,000 to Northwestern University, subject to certain life annuities.

By unanimous vote of the ten members present, the board of regents of the University of Minnesota adopted on June 10, the report of the sub-committee for the establishment of courses in graduate medical instruction at Rochester, Minn., in connection with the Mayo Foundation for Medical Education and Research, as printed in last week's issue of SCIENCE.

THE sum of \$30,000 has been given to Dalhousie University, Halifax, N. S., toward the endowment of a chair of anatomy, and announcement is made that in the near future the sum will be doubled.

MESSRS. G. A. AND H. H. WILLS have made an additional gift of £40,000 to the University of Bristol. Originally they gave £180,000 for the purpose of erecting additional buildings, but as the accepted tender exceeds that amount, they have now added £40,000.

THE department of geology of the University of Oregon will next year occupy new quarters in the large new administration building just completed. These quarters include a museum, a small classroom, a large laboratory in the basement, and an office, with probably an extra room for grinding apparatus, etc. The large general classes will be held in the new theater which is located in the same building. The geological laboratory is being equipped with a large new relief map of the state made by the Oregon Bureau of Mines and Geology and a set of Shaler-Davis physiographic models, besides other equipment.

DR. HERMON CAREY BUMPUS was installed as president of Tufts College on June 12. The speakers included President Lawrence A. Lowell, of Harvard University; Dr. Charles E. Fay, senior professor of the faculty of arts and sciences; Dean Charles F. Painter, of the Medical and Dental Schools, and Dr. Samuel P. Capen, of the United States Department of Education, president of the Tufts College Alumni Association. The inaugural address of President Bumpus was then given.

DR. JOHN CASPER BRANNER, who, when he assumed the presidency of Stanford University in 1913, announced that he would hold the office for only two years, and who recently

made this announcement effective by tendering his official resignation, has been persuaded by the board of trustees to continue in the office for another year. Dr. Branner reaches the retiring age of sixty-five this coming July.

DR. KENNETH L. MARK, associate professor of chemistry at Simmons College, Boston, has been placed in charge of the department of chemistry to fill the vacancy caused by the resignation of Professor J. F. Norris.

PROFESSOR JOHN PHELAN, of the University of Wisconsin, has been elected professor of rural sociology in the Massachusetts Agricultural College.

DR. WILLIAM M. SMITH, professor of mathematics in the University of Oregon, has been elected to succeed the late Professor J. J. Hardy at Lafayette College.

THE following changes have been made in the department of biology at Vassar College: Miss Cora Jipson Beckwith, assistant professor of zoology, promoted to associate professor of zoology; Miss Virginia Langworthy has been appointed assistant in botany, and Miss Alvalyn Woodward assistant in zoology.

At the University of Kansas, the following promotions have been announced: Assistant Professor Charles A. Shull to associate professor of plant physiology and genetics; Assistant Professor U. G. Mitchell to associate professor of mathematics; Associate Professor C. H. Ashton to professor of mathematics; Associate Professor A. J. Boynton to professor of economics; Assistant Professor A. H. Sluss to associate professor of mechanical engineering.

DONALD BRUCE, formerly supervisor of the Flathead National Forest at Kalispell, Montana, has been appointed assistant professor of forestry in the University of California.

AMONG new appointments in the University of California Medical School are those of Dr. A. W. Johnson as instructor in laryngology, otology and rhinology; Dr. Olga Louise Bridgman as instructor in pediatrics and mental abnormalities of childhood, and Drs. Alfred E. Meyers, Howard E. Ruggles and Vivia Belle Appleton, instructors in pediatrics.

DR. A. E. BOYCOTT, F.R.S., has been appointed director of the Graham Research Laboratory, the University of London, in succession to Dr. Charles Bolton.

DR. A. CASTELLANI, distinguished for his researches on pathogenic bacteria, has been elected to a newly established professorship of tropical diseases at the University of Naples.

DISCUSSION AND CORRESPONDENCE

THE HALL OF FAME

THE most accurate expression of opinion of the people of the United States regarding

plorers, with missionaries; surgeons, with physicians; architects, with engineers. Musicians, painters, sculptors, etc., are designated as artists. The order is that of the number of members elected and of votes received. Three elections have been held, in 1900, 1905 and 1910. The number of candidates elected in each and all of these elections, the number of candidates who have received votes, and the percentage of the votes for each class are given in the later columns. A few scattering votes are not included. The last column gives the three highest votes cast in 1910 for candidates not yet elected.

Hall of Fame

Class	Elected				Candidates				Percentages				Votes
	'00	'05	'10	All	'00	'05	'10	All	'00	'05	'10	All	
Authors.....	4	2	6	12	14	17	15	21	15	27	27	21	45 38 35
Statesmen.....	7	2	1	10	28	23	21	30	25	24	22	24	44 42 41
Soldiers, sailors.....	3	1	...	4	18	16	16	20	11	11	11	11	33 25 25
Preachers.....	3	...	1	4	13	14	14	17	8	7	7	7	20 19 11
Lawyers.....	3	...	...	3	9	6	6	9	8	4	4	6	28 13 13
Inventors.....	2	...	...	2	8	7	8	10	7	4	5	6	28 18 16
Scientists.....	2	...	...	2	9	7	7	9	6	5	5	5	39 26 11
Philanthropists.....	2	...	...	2	2	...	...	2	3	0	0	2	...
Educators.....	1	...	...	1	9	6	7	10	5	4	4	4	45 19 10
Artists.....	1	...	...	1	6	6	8	9	4	3	4	4	30 28 7
Missionaries.....	...	...	...	...	9	7	9	9	4	4	4	4	42 15 13
Physicians.....	...	...	...	...	5	5	5	5	2	4	3	3	36 21 14
Engineers.....	...	...	...	...	2	3	3	3	2	2	2	2	16 15 6
Business men.....	...	...	...	...	...	10	9	10	0	1	1	1	6 5 4
Others.....	...	...	...	...	2	2	2	2	0	0	1	0	16 1 ...
All.....	28	5	8	41	134	129	130	166	100	100	100	100	...

famous Americans is to be found in the elections of the Hall of Fame. This institution has been organized with the greatest care, and, although it is probable that some worthy names are omitted, no unworthy person is likely to be elected. It appears, however, from the following table, that equal prominence is not given to different departments of human knowledge. Steps are being taken in the election of 1915 to remedy this difficulty. It is hoped that it will be successful. The urgent need of the change is the object of this paper. The class is given in the first column of the table. Rulers are included with statesmen; theologians, with preachers; judges, with lawyers; reformers, with philanthropists; ex-

The disparity in the numbers elected from the different classes is very marked. It is hard to believe that there are more famous authors and statesmen than in all other walks of life, or that there are twelve authors more famous than any American missionary, physician, engineer or business man. Apparently, the only reason that the number of statesmen elected was not greater than that of authors, was owing to the greater number of candidates. Among so many, the votes were scattered. The low position in the table of the physicians is noteworthy, and the absence of votes for the philanthropists after two were elected. Under the past system few men could be elected unless they were authors or

statesmen. Of the eleven writers of fiction, nine were elected, while, of the ten authors who wrote on serious subjects, only three were chosen. As the judges are men of literary tastes, they were more familiar with the work of the authors than of men in the other classes. The uniformity of the percentages in different years is very marked. This renders more conspicuous the relatively small vote for authors in 1900. If forty votes had elected in 1910, three of the six who were chosen would have been statesmen.

As the total number of votes cast was 8,645, three fourths of them were wasted; 2,050 votes would have given the forty-one men elected fifty votes each.

EDWARD C. PICKERING

May 25, 1915

A METHOD FOR IMBEDDING SMALL OBJECTS

It is quite a task to carry minute objects, as protozoa or eggs of sea urchins, etc., through the alcohols and get them safely imbedded in paraffin, without losing most if not all of them on the way. Lefevre¹ described a watch crystal designed by him for the purpose of imbedding small objects. This crystal had a small rectangular-shaped slit in the bottom about 12 x 2 x 3 mm. This could be given a thin coat of glycerine and the objects placed in it by means of a pipette, and then the melted paraffin poured over them. When cold the paraffin can be removed with the objects imbedded in the small rectangular block which is easily trimmed for cutting. Lefevre suggested that the objects might be carried through the dehydration stages in the crystal, by drawing off the liquids with a pipette. This however, as later pointed out by Mayer, would remove the possibility of coating the crystal with glycerine and hence make it nearly impossible to remove the paraffin block when cold. Mayer² suggests an improvement by transferring the objects from absolute alcohol into small gelatine capsules. They may be cleared with xylol in the capsule and then melted

¹ *The Jour. of Applied Microscopy*, Vol. V., pp. 2080-2081.

² *Zeitschr. f. wiss. Mikrosk. u. mikr. Technik*, Bd. 24.

paraffin added, and the whole thing cooled in water. The water cools the paraffin and also dissolves away the gelatine capsule, leaving the objects imbedded in a neat cylindrical plug. There are some objections, however, to this method. (1) The great danger of losing the objects during the process of transferring them with a pipette from one reagent to another, and (2) the end of the paraffin cylinder at which the eggs lodge is rounded and hence difficult to cut. This latter obstacle was overcome by Metcalf's suggestion³ of reimbedding the objects in a Lefevre watch glass and hence removing the difficulty of having a round end to the mold. He found this successful with his preparations of *Opalina*. But even still there is great trouble attending the dehydration of these small bodies by transferring them from one watch crystal to another with a pipette or by drawing off the liquids with the pipette and leaving the objects in the dish. To make this task easier I suggest the following method which I have found successful with the eggs of sea urchins and *Cerebratulus lacteus*.

A heavy wooden base is obtained with holes bored in it of a proper size to permit ordinary homeopathic phials to stand upright in them. The size of phial I have found most convenient is about ten centimeters long and three in diameter. These phials are fitted with corks and then filled with the reagents desired in the process of fixation and dehydration. The next step in the preparation is to get some gelatine capsules (5 x 11 mm.) and give them a thin coat of shellac (shellac dissolved in 98 per cent. alcohol). This coat is best applied by immersing the capsules for a minute in a thin solution of the shellac and then standing them up on a flat surface to dry. Care must be taken to see that the capsules are completely immersed in the shellac solution so as to insure the coating of the inside surface. When dry take a fine needle and heat the point red hot and with it pierce a hole in the wall of the capsule about two millimeters from the top and another about three millimeters from the bottom. This is to permit a thorough drainage of the reagents through the capsule. A fine wire can now be fastened to the rim of

³ *Arch. f. Protistenkunde*, Vol. 13, p. 195.

the capsule and attached at its other end to the under surface of a cork fitting the phials containing the reagents. The wire should be of such a length as to just permit the flow of the reagent through the two holes in the capsule when the cork is tightly fitted into the phial. To place the objects to be imbedded in their shellac-gelatine container I take a glass rod drawn out to a desirably fine point and dip it into a celloidin solution of gelatinous consistency (12 per cent. celloidin in 80 per cent. alcohol). A little of the celloidin will cling to the point of the rod, which is then allowed to come in contact with the stock of material to be dehydrated, in my case sea urchin eggs. A number of these eggs will cling to the sticky mass, which can be easily washed into the bottom of the prepared capsule. Then it is a simple matter to run the eggs through the reagents. One only has to transfer them by taking the cork from one phial and carrying it over to the next. They may first be washed in water and weak alcohol as the outside coating of shellac is insoluble in water and weak alcohol and hence prevents the dissolving of the gelatine. By the time 95 per cent. alcohol has been reached the shellac has dissolved away, but in this medium the gelatine is insoluble and so the objects are safely retained. They can be cleared in xylol and left in melted paraffin to permit thorough infiltration. When ready for the final imbedding one can easily hold the capsule out of the phial by means of the cork to which it is attached, and slowly drop melted paraffin into the mouth of the capsule with a pipette, all the time blowing on the capsule to hasten cooling. The paraffin will cool quickly and plug up the two drain holes and form a solid cylinder. Then one may detach the capsule from the wire and place it in water where the gelatine soon dissolves, leaving a solid form of paraffin with the eggs imbedded in the end of it. To assure being able to see the eggs one may place the capsule during the dehydration process for a few minutes in borax carmine, which will stain the objects red and thus enable one to see them through the rest of the process. After being sectioned the carmine may be decolorized with acid alcohol.

This method removes the danger of losing the objects when transferring them from the various solutions with a pipette. The drop of celloidin assures their being held in a compact mass and in most cases raises the bodies far enough from the floor of the capsule so that the rounded end may be sliced off without cutting away the objects and thus give a flat surface to section from. To be absolutely sure of this one may prepare his capsules with flat bottoms before imbedding. This is done by cutting off the round end and attaching a flat sheet over the bottom with liquefied gelatine and cementing it with shellac. Or again after the objects are imbedded in the round end of the capsule they may be sliced out and reimbedded in a Lefevre watch glass as suggested by Metcalf.⁴

This method will, I am sure, prove useful to any one having much imbedding to do, of minute objects. It has the advantages of being extremely simple, rapid and reliable.

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SOME REASONS FOR SAVING THE GENUS

As there seems to be something of a lull at present in the vexatious controversies over zoological and botanical nomenclature, I fear that I run the risk of being branded as a wanton mischiefmaker if I seek to reopen the subject in these columns. However, no one can say that the evils complained of are likely to diminish much in the near future. And furthermore, it has always seemed to me that one of the most flagrant of these evils has scarcely been *complained of* at all, at least in the public discussions regarding nomenclature. Complaint has been made, bitterly enough at times, of the constant changing of specific names, resulting from a rigid enforcement of the law of priority. In reply, it is contended, and with some plausibility, that such changes will cease automatically when the antiquarian has finally accomplished his task.

But there is another perennial source of

⁴ *Loc. cit.*

confusion which has not received adequate attention. Apparently it is regarded as quite unavoidable, or perhaps it is not commonly thought of as a difficulty of *nomenclature* at all. I refer to the continual changing of names that results from the subdivision of genera. Who has not experienced the peculiar feeling of mingled dismay and exasperation which follows the discovery that some long-familiar genus, whose species are to most of us scarcely distinguishable *as species*, has been split over night into a half dozen new genera? In place of the familiar collective group—*Jonesia*, let us say—we now have *Neojonesia*, *Eujonesia*, *Pseudojonesia*, *Megajonesia*, *Microjonesia* and *Heterojonesia*, or perhaps a set of names that no longer even suggest the former unit. And if we look for the distinctions upon which these subdivisions are based, we commonly find that the differences are very trifling indeed in comparison with the many and detailed points of resemblance between these various groups.

Let me not be misunderstood. Differences, however slight, ought when constant to be recognized and in some way incorporated into the taxonomic structure. "Splitting," so far as it is based upon the detection of such differences, is a legitimate and indeed inevitable process, if systematic zoology is to progress. Why, then, should one object to the indefinite subdividing of genera? And is it not highly presumptuous for one who is not a taxonomist at all to be offering his opinions as to what constitutes a difference of generic value?

Taking up the first of these questions, it must be borne in mind that in the Linnæan system of binomial nomenclature the generic name plays two quite distinct rôles. One of these is to designate a taxonomic group, supposed to be intermediate between the family and the species. The other is *to form the first half of the "scientific" name of each species within that group*. It is for this reason that the changing of a generic name is so much more disconcerting than is changing that of a family or order. And this is why, in the writer's opinion, such splitting as we have just recognized to be inevitable should be done

within the limits of the genus, either by the creation of "subgenera," or, if necessary, by the establishment of wholly new categories between the genus and the species.

As regards the second point above raised, I should indeed feel much diffidence in offering my opinion on this subject were there even an approach to unanimity in respect to what constitutes a character of generic value. It is frequently said that the genera of Linnæus are the families of to-day, while it is doubtless also true that some Linnæan species constitute present-day genera. Even now, the inclusiveness of the concept genus varies enormously in different groups of organisms. In general, those groups which have been studied most intensively by systematists are doubtless on the whole those in which the concept has acquired the most restricted meaning. This narrowing down of the inclusiveness of the genus is thus an evil which may seem to be progressive and incurable. Its logical outcome is the erection of a separate genus for each species, in which event the two categories will become identical. When that has come to pass, no further changes of nomenclature will be possible, and we shall have attained the much-desired stability. At the same time, all verbal clues to the nearer kinships between species will have been lost, and biology will be to that extent poorer.

Taxonomists are too prone to regard this whole question of nomenclature as one which is exclusively their own. The intrusion of an outsider into the fray is likely to be hotly resented. I remember venturing, several years ago, to express some of the above views in a letter to a well-known authority on one of the larger groups of invertebrate animals. No reply whatever was made to the line of reasoning set forth by me. I was merely "squelched" with the rejoinder that if I had sufficiently wide experience in describing species I would see things in a different light—a statement which is possibly true, though proving nothing as to the point at issue. Our taxonomic brethren have so long been treated

as "poor relations" by those who complacently believe their own studies to be concerned with *real* biology, that this sort of a "tu quoque" is now and then to be expected. But such "class consciousness" should be laid aside, and the question candidly considered whether the entire biological profession, or indeed society at large, does not have a proprietary interest in taxonomic names. A very little reflection will show that this is true. The case is not at all dissimilar to that of a coal or railway strike in which the rights of the public—the chief sufferers—are entirely ignored by the disputants. And we may say with equal justice that the chief sufferers from an unstable system of nomenclature are not the taxonomists—whether "splitters" or "lumpers"—but that host of unfortunates who are under the constant necessity of using these names, while having no share in their creation or transmutation.

Returning to the subject of generic names, it must not be supposed that the only evil resulting from this progressive "splitting" is the mere inconvenience of our having to learn new names as fast as the old ones are displaced by accredited authorities. This, indeed, is bad enough, but there is an even more harmful result which, I think, deserves further emphasis. I have spoken above of generic names as *verbal clues to the nearer kinships between species*. These clues lose their value in proportion as genera are made less and less inclusive. Let me illustrate. We have, on the coast of southern California, three common species of "ice-plant," which differ from one another strikingly in structure, appearance and habits of growth. When these three species of *Mesembryanthemum* have been assigned (as some day they will!) to the separate genera *Smithia*, *Johnsonia* and *Macarthyana*, those of us who are not systematic botanists may no longer think to look for the fundamental resemblances among these plants which appear to have so little in common. Again, I recently learned that a certain little straggling plant, with a yellow flower, which abounds along the beaches at La Jolla, is in

reality an *Oenothera*! Who will say that I added nothing to my knowledge when I affiliated this little plant with that well-known genus? But how many such clues to relationship will be left when the genus-splitter has finished his work?

The question raises itself whether the detection of resemblances in nature is not as important as the detection of differences. Is it not largely this unity in variety—or variety in unity—which fascinates the true nature-lover, be he an amateur collector, a beginning student or a professional biologist? And it can hardly be denied that the extent of our recognition of such unity is greatly influenced by the *names* which we find applied to things.

Fortunately, I am able to cite, in support of my present contention, the words of a high authority in the field of systematic zoology. W. H. Osgood,¹ in justifying his extensive use of subgenera, writes that those who object to this procedure "must necessarily recognize more and more groups as genera until the distinction between the genus and the species becomes so slight as to be of little taxonomic value, while at the same time the gap between the genus and the group of next higher rank is correspondingly increased." Such a tendency, he says, "actually operates to reduce the number of categories of classification between the subfamily and the species, and this results, not in an improved and more discriminating system of classification, but one with fewer groups and fewer possibilities for the indication of relationships." Again:

The use of subgenera provides a means of adjusting the differences usually existing between the general zoologist and the specialist. The generic name answers all the purposes of the general zoologist while the specialist may use as many subgenera as he desires and meet all the requirements of discriminating classification. This also operates to conciliate the amateur, whose outcries against the continual changing of names by specialists will thereby be lessened. Although these protests are

¹ "Revision of the Mice of the American Genus *Peromyscus*," U. S. Department of Agriculture, North American Fauna, No. 28, 1909 (citations from page 25).

often unreasonable, the specialist should remember that his scheme of nomenclature to be truly successful must answer the purposes of others as well as himself. If the specialist conservatively retains well-known and natural generic groups he may segregate subgenera indefinitely without retarding the progress of exact taxonomy, and, at the same time, without interfering with the less exacting needs of the general zoologist and the amateur. Moreover, further advantage is found in the fact that the percentage of legitimate changes of names that would confront the much-abused amateur would be greatly reduced; for changes of subgeneric names on account of pre-occupation and other causes would in most cases concern only the specialist.

I could name at least one other leading mammalogist who heartily concurs in the views quoted. So the issue is not exactly one between the "general biologist" and the systematist, but is rather one between two different types of systematists. In this conflict the "general biologist" should, I think, lend his regard for the interests of the scientific public.

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THE PROBLEM OF THE PRIBILOF ISLANDS

THE U. S. Bureau of Fisheries has issued an elaborate and handsomely illustrated report on Alaskan conditions,¹ the work of Mr. E. Lester Jones, its deputy commissioner, embodying the results of his investigations during the past summer. The major portion of this work lies outside of the writer's field, but that portion which treats of the fur-seal islands suggests a few words of comment from one who has given much time and attention to their problems.

Mr. Jones thus sums up the Pribilof Islands problem:

If moral, intellectual and general conditions are to be improved; if the business of the islands is to be carried on along business lines (and surely the proposition of these islands, including the fur-

¹ Report of Alaska Investigations in 1914; Department of Commerce, Bureau of Fisheries, by E. Lester Jones, Deputy Commissioner of Fisheries, December 31, 1914.

seal and the fox herds, is largely commercial), then the situation must be viewed from an entirely different standpoint than hitherto; for the returns the government is to receive from its investment warrant the expenditure of a sum of money large enough to give the officials of the government and the natives civilized surroundings, and to provide adequate means and necessary facilities to accomplish a proper administration of the affairs of these islands.

This summary follows the discussion of a long series of topics such as immorality and drunkenness among the natives; inadequate and unsanitary housing facilities; unsatisfactory schools; inadequate and ill-adjusted wage schedules; insufficient occupation for the natives; need of additional government agents; better facilities for unloading vessels; stricter landing regulations, etc., the conditions respecting these matters being found to be "deplorable." The keynote of the whole discussion is that the government officials and natives resident on the fur-seal islands are without civilized surroundings and that it is the duty of the government to relieve the situation.

In a residence on these islands for purposes of investigation of more than twelve months' duration distributed over five seasons and a period of seventeen years I failed to discover this lack of civilized comforts noted by Mr. Jones. On the contrary, I enjoyed such comforts to a marked degree, surpassing that which I have found possible at times in home communities of a much larger and more accessible type. I have been quartered in all of the government and company houses on each of the two islands, and there never was a time when I could not get a hot bath for the asking, and on St. Paul Island is the only place where I have ever experienced the delicate attention of having an attendant light a fire in my room before getting up in the morning. These things are specifically mentioned because Mr. Jones specifically notes the absence of bathing facilities and of janitorial service as among the deprivations to which the government officials are subjected.

Speaking of more important matters—morality, temperance, sanitation and personal cleanliness among the natives—if the summer of

1914 found them in the unsatisfactory condition which Mr. Jones emphasizes, the season was certainly an exceptional one. For this there was a very simple reason.

At the close of the season of 1912 the efficient and long-experienced representatives, four in number, who had had charge of the affairs of the government and natives for periods ranging from ten to fifteen years each, were ruthlessly displaced. They were under civil service protection but their discharge was effected by the simple expedient of omitting their salaries from the appropriation bills. In their places were substituted two underpaid caretakers, one for each island. It was ostensibly a matter of economy. Congress had just enacted a law which suspended land sealing for five years. There was no need to continue the full force of expensive agents. The sealing plant and natives could get on by themselves for a time. Such was the argument. No result other than demoralization of the service could have been expected. Mr. Jones himself admits the cause of the trouble by recommending the appointment of a superintendent and assistant superintendent for each island at salaries commensurate with the need of good men, these officers to replace the present caretakers. This is in effect a recommendation to restore the conditions of 1912 and prior to that time. It will be well if the government heeds this suggestion. Even then it will sorely miss the mature experience and capacity of the agents it turned off.

Other criticisms made by Mr. Jones, regarding inefficiency of schools, lack of occupation for the natives, delay in handling cargo, and the like, are referable to the same cause. The government weakened its island force and is suffering the inevitable consequences. Given an efficient management and the "deplorable" conditions will quickly disappear. These conditions have not, as Mr. Jones states, "existed on these islands for years." The men he found occasion to dismiss had been in charge but one season.

Mr. Jones's discussion does not touch the real problem of the Pribilof Islands at all. This has to do with the operation of the fur-seal law of 1912 which suspended land sealing.

As noted, this gave excuse for the dismissal of the responsible agents. It deprived the natives of their regular occupation and means of livelihood, making them the dependent wards of the government. Mr. Jones in a speech to the natives on St. Paul Island, which he includes in his report, calls their attention to the fact that they were receiving from the government supplies to the value of three hundred dollars a year for four days' actual labor. Idleness leads to viciousness and fosters all of the unsatisfactory conditions enumerated.

Mr. Jones does not discuss the fur-seal situation, because this matter was in the hands of a scientific commission. He passes it over in silence. At least twelve thousand killable fur seals, with skins worth approximately fifty dollars each, went to waste on the hauling grounds of the Pribilof Islands in the season of 1914 under Mr. Jones's very eyes. It was a striking thing and deserved notice in his report, especially since the report of the scientific commission has apparently not been published. In comparison with this great loss which the government sustained on the fur seal islands in the summer of 1914, the matters of which Mr. Jones does treat pale into insignificance.

The blue foxes, however, are touched upon by Mr. Jones. These are an important, if subordinate, element in the government's fur industry. The outlook for these animals on St. Paul Island is said to be "bright." On St. George Island, "owing to some fault in feeding," it was not so good, but new breeders were to be brought over from St. Paul to take the place of those which died. The advisability of selling foxes "on bids" to those wishing to engage in fox farming is gravely discussed.

This is all very interesting, but very superficial and inadequate. The blue foxes were left to starve, just the same. The herd has grown to depend largely upon the carcasses of the fur-seal killing grounds for its winter food. Commercial killing had been cut off and the killing fields were bare. The government had taken no steps to replace this food. That was why the foxes on St. George died. They died also on St. Paul. The foxes are cannibalistic under shortage of food, the strong eat the weak,

the old the young. These tragedies occur in the warrens and are not conspicuous. There is simply a diminished herd in the spring. It will be but a fragment, a remnant, of a fox herd which the government will possess when the futile law suspending seal killing has run its course three years hence. The irony of the situation lies in the fact that the foxes, thus cruelly and improvidently treated, yield skins which in 1912 sold as high as one hundred and fifty-eight dollars each. Had Mr. Jones recommended that the government send up beef from Seattle or San Francisco to feed these foxes over the winter, his recommendation would have been one which the government could well afford to consider favorably.

No; the problem of the Pribilof Islands is not one of bringing the comforts of civilized surrounding to the officials and natives. It is rather one of applying common horse sense to the administration of the fur-seal industry. The present ill-advised and wasteful law should be repealed or amended. The fur-seal herd stood ready to yield six hundred thousand dollars worth of sealskins in 1914. Mr. Jones might have had the satisfaction of seeing them taken and their value covered into the treasury. The law prevented it. He has no comment to make. Incidentally the taking of these skins would have given useful occupation to the natives, restored to them and to the foxes their wonted food, and richly earned for the officials and natives of the islands any degree of generous treatment at the hands of the government.

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A SAFE METHOD OF USING MERCURY BICHLORIDE
FOR THE ANTISEPSIS OF WOUNDS OF
LARGE SURFACE

SOME years ago the writer developed what appears to be an entirely safe and very effective method of making antiseptic extensively lacerated areas. Briefly (and I am afraid in very untechnical language) the results of the experiments were as follows:

1. The reason mercury bichloride is dangerous is that it combines with the albumen (?)

of the exposed surface of the wound. For example, if a liter of 1 to 1,000 solution be used to bathe a wound of extensive surface, all the bichloride (roughly speaking), amounting to a gram in weight, is precipitated out of the solution and remains in the wound in the form of albuminate of mercury, which is later redissolved and absorbed. Hence the subsequent poisoning.

2. If, however, the wound be first bathed with a solution having a stronger affinity for albumen than mercury (a dilute solution of chloride of zinc, and other metallic chlorides, was found to give good results) especially one which gives a granular but coherent compound, and is then bathed with water and finally with a 1 to 1,000 solution of mercury bichloride, not left in too long, the antiseptics is perfect and there are no bad after-effects. The albumen having combined with the zinc to form albuminate of zinc, seems to be no longer able to quickly combine with the mercury.

3. That mercury bichloride is a much stronger antiseptic relatively to other antiseptics than is stated in the text-books.

4. That antiseptics mixed with oils or fats, vaseline for example, lose their effectiveness almost entirely.

The importance of the matter at the present time (there is no known way of effectively disinfecting wounds received in battle) and the fact that the results were forwarded to the *Lancet* and *Nature* some years ago but not printed or acknowledged is my excuse for asking you to publish this rather crude and incomplete note.

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A SOLAR HALO

TO THE EDITOR OF SCIENCE: On the morning of May 20 an interesting solar halo was observed in the vicinity of Philadelphia, which was sufficiently unusual to be worthy of record. When observed between 11 A.M. and noon the appearance was as indicated in the accompanying diagram. A and B were two prismatic circles concentric with the sun, of radii (meas-

ured with a sextant) $22^{\circ} 10'$ and $46^{\circ} 45'$, respectively. *C* was the whitish parhelic circle, of radius $20^{\circ} 5'$ corresponding to the solar altitude of about 70° . At the intersection of the circles *A* and *C* there were slight increases of intensity but no conspicuous parhelia. *D* and *E* were much fainter arcs intersecting the parhelic circle at the point opposite the sun. If prolonged they would have been approxi-

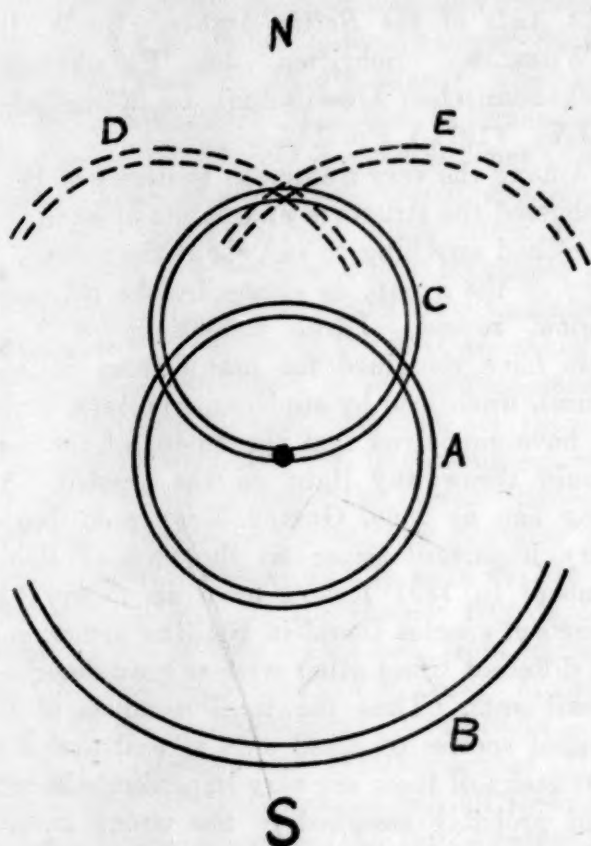


FIG. 1.

mately tangent to the 22° circle. The phenomenon was first noticed at 11 A.M. and faded soon after noon.

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QUOTATIONS

THE CONDITIONS OF INDUSTRIAL ACCIDENTS

THE enactment of laws in various states on workmen's compensation for injuries has aroused increased interest in the statistics and physical and psychic conditions of industrial accidents. The total number of these accidents is almost appalling. The lowest

estimate places the fatal accidents to adult workers in the United States at 35,000 a year, with an additional 1,250,000 non-fatal accidents. The Massachusetts Industrial Accident Board, on the other hand, placed the number of workers killed by accident yearly at 75,000, which apparently includes not only adults, but also workers of all ages, while the number of injured of the same classes was placed by this Massachusetts authority at 3,000,000 or over. An earthquake in a foreign country that kills half this number of persons and maims one fiftieth of those injured in our United States industries is spoken of as catastrophic.

Among the interesting elements of these accident statistics is the fact that a greater proportion of accidents occurs on Monday than on any other day of the week. Accidents are said to be due often to fatigue. As, after the day of rest on Sunday, workmen should be less fatigued than on other days, some other factor must be sought to explain this feature of the statistics. It has been suggested that the "blue Monday" accidents are really due to the fact that workmen take more spirituous liquor on Sunday, and thus become unnerved and more liable to accidents during the following twenty-four hours. There is, perhaps, something in this contention, though it has been disputed. In the Massachusetts Industrial Accident Board Reports, in which the official figures are given, there is scarcely more than one twentieth more accidents on Monday than on Tuesday, while Tuesday is not much above the average in the number of accidents reported for other days. Saturday, of course, shows a noteworthy reduction, because of the half holiday in some trades.

By far the larger number of accidents occur at about 10 A.M and 3 P.M. This fact is confirmed by the reports of two state boards, Washington and Massachusetts, which have secured rather careful records. As they represent the extremes of the country, the conclusions from their statistics would seem to be incontrovertible, though the fact is not what might naturally be expected. The State

of Washington Industrial Commission¹ says, "These results seem to disprove the theory that fatigue is the prominent cause of accidents, because accidents are here shown to happen at the hours when the workmen are least fatigued." On the fatigue theory it might naturally be expected that most accidents would happen after 11 A.M. and 5 P.M. The actual hour of the high point of curve of accidents shows how important are the facts and how necessary of proof the theories.

After much discussion, the tendency to speed up employment has been incriminated, as the predisposing conditions for the occurrence of accidents. This desire comes over the workman when he is not yet fatigued, but has been employed for several hours. He starts the morning's work "cold," and as he warms to his work, the danger of mischance because of haste becomes greater. Just when the speeding up reaches a climax in the morning hours, most accidents happen. The same thing is true in the afternoon. Workmen feel sluggish after their lunch, but after an hour of work warm up again, and by about 3 o'clock they are doing their most rapid work, and are at the same time more subject to accident.

With regard to accidents among children, however, there is no hour of maximum. Accidents occur at all times, and they are comparatively much more frequent among children than adults. The United States Bureau of Labor reported that "there is clear evidence of great liability to accident on the part of children. Though employed in the less hazardous work, their rates steadily exceed those of the older co-workers, even when in that group are included the occupations of relatively high liability." This was said with regard to the southern cotton mills, but the same thing is true of practically all industries in which children are employed.

The results of these accidents come to the physician. We are devoting much time to the prevention of disease, and we should be ready to give attention also to the prevention of injury. Virchow used to say that the ideal

¹ Report of State of Washington Industrial Commission for 1912, p. 178.

function of the physician, besides that of reliever of human ills, is to be the attorney of the poor for the prevention and relief of social ailments, and, above all, the prophylactic of their physical consequences, whether in lowered health or in maiming injuries.—*Journal of the American Medical Association.*

SCIENTIFIC BOOKS

The Ants of the Baltic Amber. By W. M. WHEELER. *Schriften der Physikalisch-ökonomischen Gesellschaft zu Königsberg.* LV. (1914.) Pp. 142.

Among the very numerous writers who have discussed the structure and habits of ants, few have had anything to say about the early history of the group, as shown by the paleontological record. Large collections of fossil ants have remained for many years in museums, unnoticed by students, who seem never to have conceived that the record of the past would throw any light on the present. As long ago as 1868, Gustav Mayr published a very important paper on the ants of Baltic amber; in 1891 Emery gave an account of fourteen species found in Sicilian amber, and at different times other writers have described fossil ants. Thus the total numbers of recorded species of fossil ants is well over 200, but many of these are very imperfectly known, and probably assigned to the wrong genera. The materials collected and then neglected have been very extensive, and in particular those from Baltic amber and from the Florissant shales in Colorado, numbering thousands of specimens, have invited a complete revision of paleomyrmecology. It is very fortunate that the rich collections from these two localities have fallen into the hands of Dr. Wheeler, who has undertaken the great task of setting them in order. The first section of this work, on the ants of Baltic amber, has now been published. Dr. Wheeler had the loan of the whole collection from the Geological Institute at Königsberg, as well as that of Professor R. Klebs, together with some smaller lots, the total number of specimens examined being 9,527. Of one species alone, *Iridomyrmex goepperti*, he saw 4,539 individuals. Up to the

time of Wheeler's studies, 24 genera and 52 species were known from Baltic amber; he now adds 21 genera and 40 species, in addition to revising those already known.

No ants are known from the Mesozoic; one or two recorded as such prove to belong to quite a different group of Hymenoptera. The oldest fossil ants, by far, are those described by Scudder from the Eocene of Green River and White River in Wyoming and Colorado. These, unfortunately, are poorly preserved, and afford very little information. The beds along White River near the Colorado-Utah boundary are certainly Eocene and not Oligocene, as has repeatedly been stated, apparently from confusion with the White River group of Oligocene beds from which mammals are obtained. Further collections from the insect-bearing Eocene rocks of the west are much to be desired, as well as a more complete examination of those already obtained, for there is a chance to discover very important entomological facts. In Europe, the Lower Oligocene contains the earliest ants, but includes the Baltic amber, as well as the beds at Aix in France, and probably the Gurnet Bay deposit in the Isle of Wight. This last, from which I have recently described a number of ants (*Dolichoderus*, *Leptothorax*, *Ecophylla* and *Ponera*) is perhaps later than the amber. The Middle and Upper Oligocene and all three divisions of the Miocene (the latter including the important localities Eningen in Baden, Radoboj in Croatia and Sicilian amber) have afforded fossil ants in Europe, and there is a single Italian locality assigned to the Lower Pliocene. Between the last and the Pleistocene is a blank. The supposed Miocene record from Spitzbergen is to be deleted, the specimen being the abdomen of some insect, and wholly unrecognizable.

Thus it appears that our first real knowledge of fossil ants begins with the amber, probably at least two million years ago. What development has the group shown in all this long time? To what extent are the remarkable habits and structures of modern ants products of recent evolution? From Dr. Wheeler's researches we gather these facts:

1. Of the amber genera, over 55 per cent. are still living; that is to say, 24 genera, of which four are at present cosmopolitan; four universal in the tropics, but invading semi-tropical or temperate regions with some of their species; four essentially paleotropical; five belonging to an Indomalayan and Australian series; six circumpolar; and one (*Erebomyrma*) known to-day by two species, one in Texas, the other in Peru.

2. The extinct genera are mostly allied to paleotropical forms. There is, however, little affinity with the African fauna.

3. It is by no means certain that the amber fauna all belongs strictly to the same time or general locality; yet ten cases are recorded in which two species of ants exist in the same block of amber, proving their strict contemporaneity.

4. Since the amber, "the family has not only failed to exhibit any considerable taxonomic or ethological progress, but has instead suffered a great decline in the number of species and therefore also in the variety of its instincts, at least in Europe." Already, in the Lower Oligocene, the subfamilies and modern genera were established; even some of the species were almost identical with those of to-day. *Formica flori* of amber is almost exactly the modern *F. fusca*; other species of *Formica* represent different subdivisions of the genus, quite as we have them to-day, though there is no representative of *F. sanguinea*. Other amber ants show similar resemblances. Not only was polymorphism fully established, but the larval and pupal stages show such peculiarities as we see to-day; thus the larvæ of *Prenolepis* had already lost the cocoon-spinning instinct. The amber *Iridomyrmex* pupæ were likewise naked, just as they are now. Specimens of *Lasius* carry gamasid mites, showing that these arachnids had already developed their specialized myrmecophilous characters. So also, aphids were kept by ants in those days.

5. Perhaps it would hardly be going too far to say that if the ants of to-day were likewise preserved in amber, and were submitted to a future entomologist along with those of the

Oligocene, without any information concerning their relative ages, he would hesitate to declare which was the older. At the same time, the amber ants do show some relatively primitive features, and *Prionomyrmex*, from the amber, is absolutely the most primitive of known ants. The nearest living relative of *Prionomyrmex* is the Australian *Myrmecia*. It must also be noted that the amber ants have not so far shown any marked soldier types, like that of *Pheidole*.

Some years ago I had occasion to study the bees of Baltic amber and found all the genera to be extinct, although the fossorial wasps from the same material, so far as seen, were strictly of modern genera. It is certainly true that different genera and families of insects differ greatly in their antiquity, and some of those which we might naturally suppose to be relatively recent are in fact very old. Such studies as this of Dr. Wheeler's supply a firm foundation of facts to take the place of guesses, and are of inestimable value to students of evolution.

T. D. A. COCKERELL

UNIVERSITY OF COLORADO,

May 5, 1915

The Examination of Hydrocarbon Oils and of the Saponifiable Fats and Waxes. By DR. D. HOLDE. Translated by EDWARD MUELLER, from the fourth German edition. John Wiley and Son, Inc. 1915. Pp. 483.

To present in the limited space of this book even a brief description, and standard methods of examination of the great variety of petroleum products and fats, demands a comprehensive knowledge and critical judgment. In the last edition of Dr. Holde's work this object has been well accomplished.

Petroleum and its products, the most voluminous part of the subject, occupy the larger space, yet the saponifiable fats and their products are quite comprehensively included.

In its general plan the book presents brief descriptions of properties and composition, general reactions, behavior towards reagents and standard quantitative physical and chemical methods of examination. There is a great condensation of subject-matter by means of the

97 tables that are interspersed throughout the book, and that summarize much valuable data in connection with the subject in hand.

Products recently brought into commercial use are described with methods of control. The physical examination of the hydrocarbon oils and their derivatives includes specific heat, heat of vaporization, viscosity, calorific power, coefficient of expansion and optical properties. Rotary power of mineral oils receives attention, more especially in European oils where it is apparently more general than in American crude oils, or their products. The recently proposed formol reaction (formic aldehyde and concentrated sulphuric acid) on mineral oils is described, and some other recently proposed methods. Large space is properly devoted to lubrication, lubricants and greases, asphalts and tars. With the marvelous expansion in the use of motor power, the several recent methods for increased output of gasoline from inferior oils and the general replacement of kerosene for lighting, it appears that gasoline and lubricants will soon be the principal products refined from petroleum. Much serviceable information is presented concerning non-drying oils and solid fats, vegetable semi-drying oils, and drying oils, animal oils and oils from marine sources. The chapter devoted to technical products derived from fats and oils, blown oils, soaps, soap powder, turpentine wood oils, boiled oils, resins and allied products both in description and methods will be found useful.

Certain looseness in statement appears here and there. Caustic soda is of equal necessity with sulphuric acid in refining to remove sulphonic acids and particles of sludge that permeate the oil after the acid treatment. Fuller's earth is used only after acid treatment to remove color. The two general types of petroleum suggested are not inclusive. The writer has a barrel of Russian crude oil that distills to less than one per cent. below 350° at. pres. California, Wyoming, much Kansas, and southern crudes do not fall within this classification. Mercaptans are not contained in American crudes so far as known. On page 63 it is mentioned that the method of Carius

is not suited for the determination of sulphur in kerosene, since even a poor oil must not contain more than a few tenths of one per cent. of sulphur and only a small amount of the oil can be used. Probably by tenths was intended a few hundredths of one per cent. Of course the simplest way for sulphur in kerosene is the lamp method that has been used by the Standard Oil Company for many years. But sulphur to thousandths of one per cent. in any crude petroleum or in any of its products, except perhaps the most volatile gasoline, may be expeditiously determined by combustion in oxygen and titration. This standard method in use for years is not mentioned.

Neither Texas, Ohio, nor other American crudes, except those in California, contain any large proportion of nitrogen compounds, and these compounds so far as examined are not of the pyradine series but, including Bakucrude, they are derivatives of the hydroquinolines.

However, those minor inaccuracies do not detract from the usefulness that this book offers to all workers in these broad fields.

CHARLES F. MABERY

THE ADOPTION OF THE MISSOURI SYSTEM OF GRADING AT GOUCHER COLLEGE

At Goucher College the faculty has recently adopted the "Missouri System" of grading. It may be of interest to some who are contemplating the introduction of this system, or to others interested in the theory and practise of grading, to learn a few of the details of this proposed application of the system.

Four passing grades and two grades below passing are defined. Grade C is to be assigned to approximately the middle 50 per cent. of each class. Grades A and B together are assigned to those above C, grade A being that of approximately the uppermost 3 per cent. and B that of about the other 22 per cent. In the opposite direction, grade D is to be assigned, in required courses, to approximately the 15 per cent., and in other courses to about the 22 per cent., just below C. Grade E is to indicate incomplete work or unsatisfactory work that can easily be made up, such as is customarily

marked "conditioned." Grade F denotes failure to receive any credit for the course. Grades E and F together are to be assigned, according to the discretion of the instructor, to approximately the lowest 10 per cent. in required courses, and to the lowest 3 per cent. in other courses.

These percentages are summarized as follows:

	Passing Grades				Not Passing
	A	B	C	D	E and F
In required courses	3	22	50	15	10
In other courses	3	22	50	22	3

It will be seen that grade A is intended to mark work of unusually good quality which it seemed desirable, in the absence of any other system of "honors" in the college, to distinguish from that accomplished among so large a group as the upper fourth. The difference in the percentages of conditioned and failed (E and F) in required and not-required courses, is intended partly as a check upon entrance; it also takes into account the fact that under the usual conditions of admission to colleges, there should be a considerable elimination of the poorest students during the first years of the college course, when the proportion of required courses is high. Moreover, this arrangement recognizes that students are guided somewhat in their choice of elections by the advice of instructors and by their tendency to elect work in subjects which experience has shown them fitted to continue.

Theoretically the elimination of the poorest students in the required work early in the curriculum would affect slightly the sizes of all the remaining groups in the advanced or elective courses, but in practise this effect would probably not extend beyond the lowest passing grade; hence grade D is enlarged in these courses, while the middle and higher grades are not altered. Whether this will result in justice on the whole, can be determined only after experience with the system.

The size of the upper grades A and B is not increased in the most advanced or major courses, for the simple reason that to do so would in effect be applying the standard of

the elementary course to the work of the advanced course. When expectation or requirement concerning quality of work advances in correspondence with the advanced character of the courses, justice is most nearly assured by assigning approximately the same percentages of grades A, B, C in all courses.

The system as adopted emphasizes also the idea that the proposed percentages may not be precisely observed in any single class in a single year, especially among the smaller classes. But it is expected that the deficiencies in the assignments of particular grades of one year, will be balanced by the excesses of another year, so that there will be no constant tendency on the part of any instructor's grades to deviate widely from the percentages agreed upon. In very small classes the grades of a single year may deviate more widely from the ideal than those of the larger classes, but the combined reports of several years are expected to show essential approximation to the definitions.

WM. E. KELLCOTT

GOUCHER COLLEGE

SPECIAL ARTICLES

A SAFE PORTABLE LAMP BATTERY

THE use for class work in physiological laboratories of zinc and ammonium chloride, or other forms of cells, is inconvenient and involves constant renewal. To supply large classes with dry batteries becomes an item of considerable expense. When the 110-volt direct current is available "lamp batteries" (or, properly speaking, lamp resistances) are more convenient, and cheaper to use; and if they are permanently installed under the work bench where the student can not alter the connections nor easily short circuit them, they are safe enough.

For many purposes, however, it is more convenient to have the lamps mounted on a piece of board six or eight inches square, so that the battery can be carried anywhere about the laboratory and connected with any socket by means of a cord and plug. The great disadvantage of such a portable battery is that with inexperienced students it may easily re-

sult in a serious blow-out. Thus with the ordinary arrangement of the lamps, as shown in Fig. 1, if *B* is the live wire and *A* is the grounded wire of the city lines (and one is usually grounded), no harm results if *E* happens to come in contact with a gas or water pipe. But if *A* is the live wire, and one happens (as there is an even chance of doing) to have pushed the plug into the socket so that the lamp *C* is nearest to the grounded line, then the whole pressure of the city system bears upon any chance contact of *F* with any metal object leading to ground.

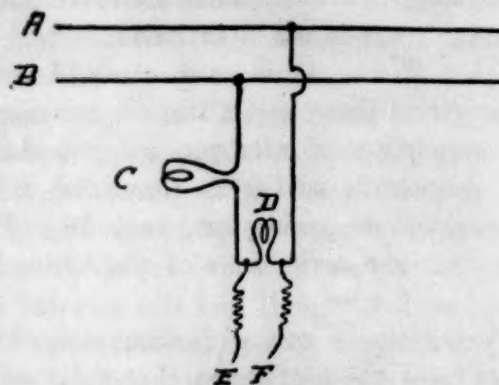


FIG. 1

To avoid this danger the form of battery shown in Fig. 2 has proved convenient. To give the same current the lamps *C* and *C'* in Fig. 2 must be twice the size (twice the current consumption and illuminating power, or in other words half the resistance) of *C* in

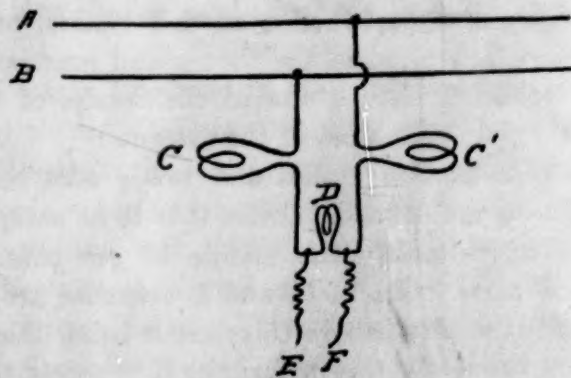


FIG. 2

Fig. 1. As both sides of the battery are then the same, it does not matter whether *A* or *B* is the live wire, nor which way the plug is put into the socket. If *E* or *F* happens to touch a grounded object, the lamp on that side merely

brightens (they are usually barely luminous), while that on the other side becomes entirely dark. For most physiological purposes a suffi-

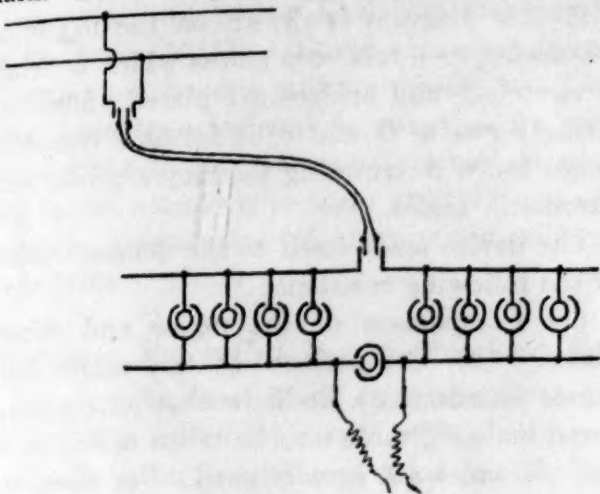


FIG. 3

cient current is obtained if *C* and *C'* are 80-watt carbon filament lamps and *D* is a 50-watt

or the signal magnet disconnected. With this arrangement it is not easy for one careless student to upset the entire system, and he is easily located if he does. One lamp battery operates effectively a large number of signal magnets in series.

When, as in work with the graphic method, it is desired to have an automatic record on the smoked paper of the instant at which some nerve was stimulated, the arrangement shown at the right in Fig. 4 is convenient. It consists merely of another lamp battery, induction coil and a double knife-edge switch. One blade of the switch is connected as a making and breaking key in the coil circuit, and the other as a short-circuiting key in the time circuit. Thus the interval of stimulation when the key is closed is indicated on the graphic record by the cessation of the movements of the signal magnet, and the time record recommences the

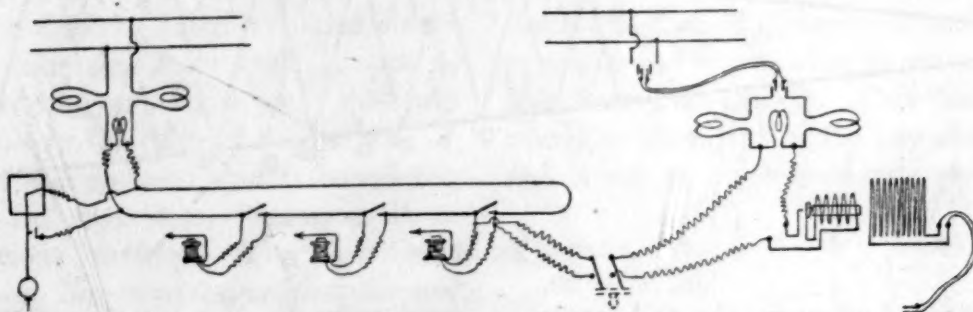


FIG. 4

lamp. For some physiological induction coils (*e. g.*, the Harvard coil) it is necessary, however, to use larger lamps (120 watts) in *C* and *C'*. If still more current is wanted two or more sockets can be screwed to the board on each side, connected in parallel and filled with lamps until the needed current is obtained. Fig. 3 shows the arrangement of the sockets on the board.

In Fig. 4 is shown a convenient method of wiring the entire student laboratory for recording time. The figure shows at the left the lamp battery and the clock. The latter may be placed either in series with the signal magnets or so as to short-circuit the current, as it is in the diagram. The signal magnets must all be arranged on the line in series, each with a short-circuiting key to be closed when the time record at that place is to be discontinued

instant the stimulation is ended by the re-opening of the key. YANDELL HENDERSON

YALE MEDICAL SCHOOL

A SIMPLE DEVICE FOR DEMONSTRATING THE TEMPERED SCALE

THE diatonic scale, consisting of a succession of eight tones and containing three intervals known as "major second intervals," two known as "minor second intervals" and two "half-tones," is not adapted to musical instruments of "fixed pitch" (*e. g.*, the piano, harp, etc.) for the reason that it does not without a multiplicity of keys (strings) allow of transposition or change of keys.

For fixed-pitch instruments, therefore, the scale is modified in the following manner. First, an additional tone is inserted in each of the larger intervals (major and minor seconds)

of the scale—thus breaking the octave into twelve instead of seven intervals, and second, the pitches of the various tones are so altered as to make the interval between any two successive tones the same. This scale is known as the scale of "equal temperament" or briefly, the tempered scale.

The "interval" between two tones, as the term is here used, is the ratio of the pitch of the higher tone to that of the lower. It follows that on the tempered scale this ratio is the same for any two adjacent tones. The numerical value of this interval is 1.05946, since the sum of twelve such intervals is 2, the numerical value of the octave interval.

These considerations coupled with the fundamental law of string vibrations, to the effect

which $Oc/OC = OC/Od = Od/OD = \text{etc.}$, the value of this ratio being 1.05946 by construction.

If this diagram is drawn on the top of a sonometer, or a table-top across which a string is stretched, and bridges are placed under the string opposite O and c , it forms a complete finger board for running the major, minor and chromatic scales.

The device lends itself to the demonstration of the following relations:

(1) Comparison of the major and minor scales. (2) Comparison of the major and minor chords. (3) To show that on the tempered scale any note may be taken as key note, and all scales are equally good. For this purpose choose any point as starting point, call-

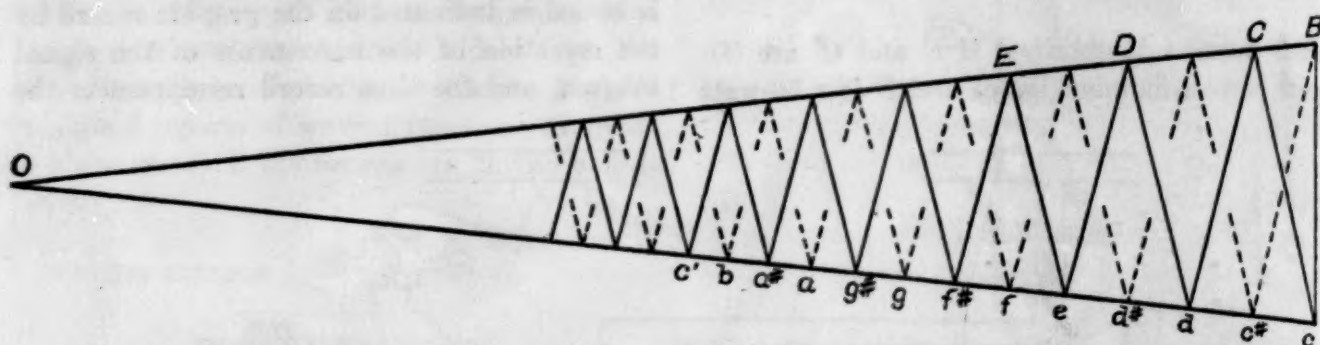


FIG. 1

that, for a string of given weight and tension, the frequency of a vibrating segment is inversely proportional to its length, suggest a simple method of finding those string lengths which will give the successive tones of the tempered scale.

Draw two intersecting straight lines including any convenient angle (see accompanying diagram). From the point of intersection lay off on one line any convenient length $Oc = L$, on the other a length $OC = L \div 1.05946$. Join the points Cc by a straight line.

Locate the corresponding points B and $c\sharp$ and join by a dotted straight line. Now draw the series Cd , dD , De , etc., and the dotted series, parallel to $Bc\sharp$ and cC . By this means the points $c\sharp$, d , $d\sharp$, e , etc., are determined at which a string of length $L (=Oc)$ must be stopped to give the successive tones of the tempered (chromatic) scale. This will be evident from the construction of the figure in

ing it point 1. Number the points from point 1 upward. Sound in succession the tones given by the string when stopped at points 1, 3, 5, 6, 8, 10, 12 and 13. (4) Comparison of just and tempered scales. Lay off from O on Oc lengths equal to $8/9$, $4/5$, $3/4$, $2/3$, $3/5$ and $8/15$ of L . The points so determined are those at which the string should be stopped to give the tones of the just scale. A glance at the board will now show to what extent each interval of the tempered scale is falsified.

L. B. SPINNEY

IOWA STATE COLLEGE

THREE STRAWBERRY FUNGI WHICH CAUSE FRUIT ROTS

IN my investigation of strawberry troubles in Louisiana last year,¹ and later in a study of market berries in this state, I frequently found upon spotted berries the fungi described be-

¹ SCIENCE, N. S., 39: 949, 1914.

low. The diseases were present in so large a percentage of the market berries as to make it apparent that they are real economic factors. In a recent trip to the Louisiana strawberry fields (April, 1915), I found the same fungi present upon berries still in the fields. The fungi have been isolated in pure culture and inoculations made. It seems desirable therefore to call attention to them at this time. A complete presentation of their study will be made later.

Strawberry Fruit Rot Due to Patellina Sp.

This rot begins either on green or ripe berries as a microscopic spot which enlarges slowly in green berries and more rapidly in ripe ones. In ripe berries the spot becomes sunken, the area tan colored. The margin is quite definite. The surface is soon studded thickly with sporodochia which vary from globular to patelliform to saucer-shaped, usually with a distinct, often wrinkled sterile margin. In color they vary from hyaline to tan, or when resting on the ripe berry they may take on completely the color of the berry.

The core of the diseased spot is completely occupied by the mycelium, rendering it of spongy tenacious texture. The host cells along a narrow line separating the diseased from the normal area are softened and separated from each other, evidently by enzyme action. It is therefore possible to lift out in its entirety the diseased tissue. The spot in a ripe berry increases in size sufficiently fast to involve the whole of a large berry in about four days. The fungus has been isolated and positive inoculations have been made. It clearly belongs to the genus *Patellina* and appears to be as yet undescribed.

Strawberry Fruit Rot Due to Sphaeronemella Sp.

THIS rot occurs with or separate from the one above described. It differs distinctly in character of spot and is much less rapid in its effects. The spot is not definitely bounded nor is there such evidence of enzyme action as described above. The affected berry soon becomes completely covered with the *pycnidia*, which

are tan-colored to black, distinctly rostrate and are of such peculiar gelatinous texture that berries affected with this disease can be distinguished by feeling of them.

The causal fungus has been isolated and positive inoculations have been made. It is a *Sphaeronemella* apparently quite distinct from *Zythia fragariae* Laib. and seems to be undescribed.

Each of the above fungi has been found repeatedly on market berries and they are clearly present in sufficient frequency to render them of considerable economic significance.

Strawberry Black Rot Due to Sphaeropsis

LAST year both in Louisiana and in the market here, I frequently found berries which showed a very peculiar blackening or a bronzed appearance. Such berries rotted down dry and eventually shrivelled. Examination showed the presence of abundant dark coarse mycelium similar to that of *Sphaeropsis malorum* and of *pycnidia* and spores also, as yet indistinguishable from that fungus. This disease was not nearly so abundant as the two above described and is not of much economic significance.

F. L. STEVENS

URBANA, ILL.,
May 3, 1915

SOCIETIES AND ACADEMIES

THE BOTANICAL SOCIETY OF WASHINGTON

THE 105th regular meeting of the Botanical Society of Washington was held in the Assembly Hall of the Cosmos Club, at 8 P.M., Tuesday, May 4, 1915. Thirty-three members and four guests were present. Dr. George R. Lyman was elected to membership. Dr. Camillo Schneider, general secretary of the Dendrologischen Gesellschaft of Austria-Hungary, was present as a guest of the society. The scientific program was as follows:

The Botany of Western Yunna (China): DR. CAMILLO SCHNEIDER.

Dr. Schneider has just returned from a year's journey in the high mountains of western Yunna. He has carried on in the region of the upper Yangtze investigations in botany, zoology and ethnology. He obtained a great number of colored photographs taken from nature (Lumiere, autochromes) of which he exhibited 25 with the lan-

tern. These showed most interesting plant types of the high mountains near Li Chiang at an elevation of 10,000 to 17,000 feet. Especially striking was a new *Primula*, first discovered a few years ago, with a spiked inflorescence which more resembles an orchid than a *Primula*. It has been named *P. Littoniana*. The buds are of a dark purple, while the open flowers are colored. A very peculiar plant of biological interest is a new *Saussurea*, which inhabits limestone boulders at about 17,000 feet and has the flowers hidden among the leaves, which are densely hairy and protect them from snow and frost. The virgin forest of the Li Chiang zone consists of *Pinus Massoniana*, various *Piceas*, *Abies Delavaya*, *Tsuga Yunnanensis*, evergreen oaks, many *Rhododendrons* and numerous other shrubs and herbs. The cryptogamic flora is also very rich. Dr. Schneider has collected over 3,000 different species of phanerogams and ferns.

The Genus Endothia: DR. N. E. STEVENS.

To be published in full elsewhere.

Endothia Pigments: DR. LON A. HAWKINS.

To be published in full elsewhere.

Identification of the Teonanacatl, or "Sacred Mushroom" of the Aztecs, with the Narcotic Cactus, Lophophora Williamsii, and an Account of its Ceremonial Use in Ancient and Modern Times: MR. W. E. SAFFORD.

The early Spanish writers describe certain feasts of the Aztecs in which a narcotic called by them *teonanacatl*, or "sacred mushroom" was used as an intoxicant. Bernardino Sahagun, writing before 1569, states that it was the Chichimeca Indians of the north who first discovered the properties and made use of these "evil mushrooms which intoxicate like wine." Hernandez distinguishes them from other mushrooms (*nanacame*, plural of *nanacatl*) which are used as food, by the distinguishing adjective *teyhuinti*, inebriating, "*quoniam inebrare solent*." The belief survives that the drug thus used was a mushroom; according to Rémi Siméon, the *teonanacatl* is "une espèce de petit champignon qui a mauvais gout, enivre et cause des hallucinations."¹ Investigations of the author have proved that the drug in question is not a fungus but a small fleshy spineless cactus endemic on both sides of the Rio Grande in the vicinity of Laredo, Texas, and in the state of Coahuila, ranging southward to the states of Zacatecas, San Luis Potosi, and Querétaro, a region inhabited in ancient times by the tribes

¹"Dict. de la langue Nahuatl," p. 436, 1885.

called Chichimecas. The drug is prepared in two principal forms: (1) discoid, in which the head of the plant is cut off transversely, and when dried bears a close resemblance to a mushroom; (2) in longitudinal pieces or irregular fragments, in which the entire plant, including the tap root, is sliced longitudinally into strips, like a radish or parsnip, bearing no resemblance whatever to a mushroom, and designated by early writers as *peyotl*, and also as *raiz diabolica*, or "devil's root."

The first to call attention to the ceremonial or religious use of this drug by the Indians of today was Mr. James Mooney, of the Bureau of American Ethnology, in a paper read before the Anthropological Society of Washington, November 3, 1891. Since the time of Mr. Mooney's observations the use of the drug has spread widely among the Indians of the United States, by whom it is commonly called "mescal button" or "peyote."

Efforts have been made to prevent the Indians from using it, chiefly because it is believed by some of those interested in the Christianizing of the Indians that it has a tendency to make them revert to their primitive condition and to their heathen beliefs. Action was taken in the courts to prosecute a certain Indian for furnishing this drug to the Indians of the Menominee Reservation of Wisconsin on March 15, 1914. It developed that the drug was received by parcel post from the vicinity of Laredo, Texas. In a paper before the Lake Mohonk Conference in October, 1914, affidavits of certain Indians of the Omaha and Winnebago tribes of the Nebraska reservation were read. The evidence showed that there is a religious organization among the Indians called the "Sacred Peyote Society," the ceremonial meetings of which are remarkably like those of the ancient Mexicans in which the "sacred mushroom" was eaten; and the physiological effects, as described by those partaking of the drug, were identical with those attributed by the early writers to the *teonanacatl*. The chemical properties of the drug have been studied in Germany and the United States, especially by Lewin, of Berlin, Heffter, of Leipsic, and the late Ervin E. Ewell, of the Bureau of Chemistry, U. S. Department of Agriculture; and the physiological effects by Drs. D. W. Prentiss and Francis P. Morgan, of Washington, D. C.; but it is not possible to give the detailed results of these investigations in the scope of the present paper.

As far as the author knows, this is the first

time the identity of the "sacred mushroom" or "flesh of the gods" with the narcotic cactus known botanically as *Lophophora Williamsii* has been pointed out. That the drug was mistaken for a mushroom by the Aztecs and early Spaniards is not surprising when one bears in mind that the potato (*Solanum tuberosum*) on its introduction into Europe was popularly regarded as a kind of truffle, a fact which is recorded by its German name *Kartoffel*, or *Tartuffel*.

PERLEY SPAULDING,
Corresponding Secretary

THE BIOLOGICAL SOCIETY OF WASHINGTON

THE 542d meeting of the society was held in the Assembly Hall of the Cosmos Club, Saturday, May 15, 1915, called to order at 8 P.M. by President Bartsch, with 43 persons present.

On recommendation of the Council, Francis N. Balch, Boston, Mass., and Ernest P. Walker, Wrangell, Alaska, were elected to active membership.

Under heading exhibition of specimens, Dr. L. O. Howard showed lantern slides from photographs of the moth, *Ceratomia amyntor*, bringing out its protective coloration while at rest on bark.

The first paper of the regular program was by C. H. T. Townsend, "Two Years' Investigation in Peru of Verruga and its Insect Transmission." Dr. Townsend said:

The four stages of verruga are defined as *incubative*, *fever*, *quiescent* and *eruptive*. The most important symptom of the fever stage is the presence of bacilliform bodies (*Bartonella bacilliformis* Strong *et al.*) in the erythrocytes. The histology of the eruptive papules is not yet sufficiently defined for positive diagnosis in the absence of the clinical history, but its chief feature is a marked proliferation of angioblasts.

Verrugas Canyon is the best known and probably one of the strongest endemic foci of the disease. Extended investigations were carried on there both day and night at all seasons of the year. The result was an ecological demonstration of *Phlebotomus verrucarum* Townsend as the vector of the disease. This demonstration is built on the unique etiological conditions already known. Verruga can be acquired only by direct inoculation into the blood, is only contracted at night, is confined to very restricted areas within which it is almost universally contracted at any time of year by nonimmunes who remain from seven to ten consecutive nights. These conditions necessitate a bloodsucking vector which is abundant, active only

at night but throughout the year, and whose distribution is coterminous with the infected areas. The above *Phlebotomus* is the only bloodsucker which meets these requirements.

Clinical verification of the vector was obtained from the history of numerous cases of verruga observed by Dr. Townsend. Transmissional demonstration in laboratory animals lacked completeness only by reason of the impossibility of positively diagnosing verruga eruptive tissue, papules having been produced in the animals by injections of the crushed *Phlebotomus*.

A biting experiment in man was carried through, resulting in what appeared to be a light infection. This was the case of McGuire, who exhibited all the symptoms but with a paucity of the bacilliform bodies in the erythrocytes. Papules appeared sparingly after the subject had been discharged. Dr. Townsend's assistant, Mr. Nicholson, accidentally received many *Phlebotomus* bites, thereby furnishing a clean experiment with two checks. The checks were Dr. Townsend and his assistant, Mr. Rust, both of whom were subjected to exactly the same conditions as Mr. Nicholson except that they did not receive the bites. They did not contract the disease, while Mr. Nicholson showed a well-marked case with both the bacilliform bodies in the erythrocytes and the characteristic eruption.

Lizards were suggested as a possible reservoir of verruga, from the fact that they were the only vertebrates aside from man, domestic or wild, at Verrugas Canyon, whose blood showed bacilliform bodies. The lizards inhabit the numerous loose rock walls which everywhere in the Andean region take the place of fences, and these are the favorite diurnal hiding places of the *Phlebotomus* swarms. Injection of the lizard blood into guinea-pigs resulted in similar bodies in the erythrocytes of the injected animal.

The unity of verruga was insisted on, in opposition to the thesis of Dr. R. P. Strong and his associates. The entire Peruvian medical fraternity concur in this view. The facts given in support of it appear to be irreconcilable with the opposite view.

Prophylactic measures were outlined; and the remarkably perfect climatic conditions of the verruga zones, unequaled for sanatoria, were dwelt on.

The paper will be published in full in the *American Journal of Tropical Diseases and Preventive Medicine*.

Dr. Townsend's paper was illustrated by lantern

slides made from photographs of *Bartonia bacilliformis*, of clinical cases, of the micro-pathology, of the *Phlebotomus*, and of Verrugas Canyon, etc. It was discussed by Admiral G. W. Baird and medical inspector H. E. Ames.

The second paper of the regular program was by W. Dwight Pierce, "The Uses of Weevils and Weevil Products in Food and Medicine." Mr. Pierce described in particular the trehala manna of Syria which is the cocoon of the large weevil known as *Larinus nidificans*. These cocoons are used by the natives as a food similar to tapioca and are also commonly sold in drug stores for use in making a decoction said to be efficacious against bronchial catarrh. The cocoons are made by an abdominal excretion of the larva and contain a large percentage of sugar known as trehalose as well as a carbohydrate, a little gum, and a small amount of inorganic mineral matter.

Specimens of the trehala manna and of the weevil were exhibited.

The third communication was by L. O. Howard, "Some Observations on Mosquitoes and House Flies." Dr. Howard spoke of the work which is being done in New Jersey against mosquitoes, describing the organization of county inspectors which was effected at Atlantic City in February at an "antimosquito convention." He showed a series of lantern slides illustrating the very effective work done by the Essex County Commission in the vicinity of Newark, N. J. He then spoke of work done by Mr. Hutchinson of the Bureau of Entomology in regard to trapping the maggots of the house fly, illustrating his remarks with lantern slides showing a large out-door maggot trap in use during the summer of 1914 under Mr. Hutchinson's direction at College Park, Md. The illustrations in question appear in U. S. Department of Agriculture Bulletin No. 200.

The last communication was by A. L. Quaintance, "Remarks on Some Little-known Insect Depredators."

Mr. Quaintance called attention to certain species of insects which have but recently come into prominence as of economic importance and to other species which, although long known to entomologists as occasional pests, have recently attracted attention in view of local outbreaks. A species of Jassidæ, *Typhlocyba obliqua*, is at the present time seriously destructive to apples in portions of the Ozark mountain region and in Kansas. These insects occurred in countless numbers in some orchards, infesting the lower surface of the leaves, causing the foliage to drop with subse-

quent injury to the fruit crop and the trees. A Tineid insect of the genus *Marmara* was reported to have caused a good deal of injury to certain apple orchards in Albemarle County, Virginia. The caterpillar makes long, serpentine mines under the skin of the apple, resulting in blemishes. The keeping quality of the fruit is also lessened. The common walking stick, *Diapheromera femorata*, while often the cause of more or less local defoliation in forests, occasionally becomes a serious pest in orchards, especially in orchards adjacent to woodlands. These walking sticks have recently been complained of on account of important injuries to apple and peach orchards in Virginia and West Virginia. *Rhabdopterus picipes*, a Chrysomelid beetle, has recently been discovered as damaging cranberries. The insect is a near relative of the grape root worm, *Fidia viticida*, and the larvae work on the roots of cranberry, feeding principally on the fibrous roots, but also stripping the bark from the older roots. Investigations of the insect by Mr. H. B. Scammell indicate that it is restricted in cranberry bogs to the higher and sandier soils. *Nezara hilaris*, one of the stink bugs, and long known to feed on vegetation of various sorts, has recently become very abundant and destructive to peaches in the Marblehead district in northern Ohio. These plant bugs in feeding insert their beaks in the developing fruit, causing the peaches to become knotty and misshapen as they grow, and many of which fall from the trees. *Parandra brunnea*, better known as the chestnut telephone borer, following investigations by Mr. Snyder, has been determined by Mr. Fred. E. Brooks to be very generally present in the heartwood of old apple trees and as a result of its work the trees are often so weakened that they are easily broken or blown over by winds. Various species of Cecidomyidæ are known to be serious crop pests, as the sorghum midge, the pear midge, etc. A new midge pest, *Contarina johnsoni*, has during recent years come into prominence on account of its injuries to grapes in the Chautauqua and Erie grape belts. The adults oviposit in the blossom buds which may contain from 10-70 maggots, though the average number is much less. Many blossoms are thus destroyed, resulting in very ragged and imperfect bunches of grapes.

This paper was illustrated by lantern slides showing the insects and their work from photographs prepared mostly by Mr. J. H. Paine.

At 10.15 the society adjourned until October.

M. W. LYON, JR.,
Recording Secretary